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THE ANATOMY OF THE Human Body.

E. N. Austin

BY

WILLIAM CHESELDEN,

SURGEON to Her MAJESTY,

F. R. S.

And SURGEON to St. *Thomas's-Hoſpital.*

Of all God's Works that do this World adorn,
There is not one more fair and excellent,
Than is Man's Body both for Power and Form.

SPENCER.

The FOURTH EDITION.

With the Addition of an *APPENDIX*, which alſo is printed ſeparately for the Uſe of thoſe who have the former Editions.

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TO
Dr. *Richard Mead*,
Fellow of the College of Phyſicians in London, And Fellow of the Royal Society.

SIR,

EVERY part of Physick may juſtly preſume on Your protection, to whom it owes ſo much improvement. ANATOMY in particular has received ſuch advantage from Your LECTURES, that it were a kind of injuſtice not to dedicate all endeavours in that way to You; in me indeed it would be unpardonable not to offer the fruits of thoſe ſtudies, which at firſt began, and have ſtill been carried on with Your encouragement. The kind reception my induſtry has met with, is owing to You, the authority of whoſe opinion has in every place ſecured me ſo much favour;

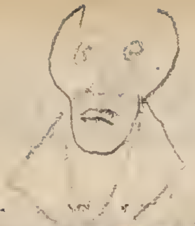
vour; eſpecially in that ſeat of learning, which with diſtinguiſhed honours rewarded Your merit. I am,

SIR,

Your moſt obliged and

obedient humble Servant,

WILLIAM CHESELDEN.



THE

PREFACE.

THIS *treatiſe being deſigned for the uſe of thoſe who ſtudy* ANATOMY, *I have diſpoſed it in the ſame order in which it is uſually taught. The bones firſt, and then the muſcles, becauſe the knowledge of the bones is neceſſary to the knowledge of the muſcles; and afterwards the veſſels, becauſe their ſituations are chiefly deſcribed by the bones and muſcles, near which they are ſituated. But before we ſhew the veſſels*

ſels in the limbs, we find it neceſſary to ſhew the parts in the three cavities, which I have endeavoured to do in that order which is moſt convenient to diſſect in, and fitteſt for the explanation of the animal œconomy: But the parts of generation, and the five ſenſes, being fit to be conſidered ſeparately, they are all done in a diſtinct book.

IN deſcribing of the parts, I have pretty much neglected the Minutiæ *in* ANATOMY: *Nor have I been very particular about thoſe things which cannot be underſtood without being ſeen, and being ſeen need little deſcription; but have endeavoured to be more explicit about thoſe which are of greateſt uſe in* PHILOSOPHY, PHYSIC, *and* SURGERY: *And I could wiſh the dividing and diſtinguiſhing of parts were uſually* *done with more regard to theſe valuable ends.*

I MUST here acknowledge my obligations to Mr. Monro, *profeſſor of* ANATOMY *at* Edinburg, *who, beſides thoſe excellent chapters of the* Ductus Thoracicus *and the nerves, with other paſſages acknowledged in their reſpective places, has ſent me ſo many remarks upon the former editions that there are but few pages in this, which are not the better for him.*

IN this edition there is no alteration nor addition, except the Appendix; and the plates being worn out, having printed between three and four thouſand, I have broke them to pieces, with an intention to make a new ſet of plates, in which no expence ſhall be ſpared: And *as I have taken care to do juſtice to the buyers of the former editions, by giving them leave to change their books at a low price; ſo I do intend, if I print another, to act in the ſame manner.*

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E.D. Aust

THE ANATOMY OF THE Humane Body.

The General Introduction.

IT is a received opinion, that an animal body is a Compages of veſſels, variouſly diſpoſed to form parts of different figures, for different uſes.

THE ancients ſuppoſed, that the heart and brain were firſt formed, and that all the other parts proceeded from them, and that all membranes were derived from the Dura Mater, or Pia Mater of the brain. They diſtinguiſh'd all the parts into ſpermatic and ſanguineous; and frequently engaged themſelves in diſputes about the derivation of parts; with many other things of the like nature, conſequences of their Hypotheſis. But the moderns, aſſiſted with glaſſes, have diſcovered, that all the parts exiſt in miniature, from the firſt formation of the Fœtus; and that their increaſe, is only the extenſion and thickning of their veſſels, and that no part owes it exiſtence to another.

Thus much I thought neceſſary to premiſe, that the reader might have a general idea of the body, and that he may ſee for what reaſon no notice is taken in this treatiſe of ſome diſtinctions and diviſions of parts, uſed by ancient Anatomiſts, and thoſe who have copied after them.

The conſtituent parts of the animal body, are, Fibres, Membranes, Arteries, Veins, Lymphæducts, Nerves, Glands, Excretory Veſſels, Muſcles, Tendons, Ligaments, Cartilages and Bones; to theſe may be added the Hair and Nails, tho' they ſeem to have only a vegetative kind of life.

Fibres, as they appear to the naked eye, are ſimple threads of the minuteſt blood veſſels or nerves, or both, which enter into the compoſition of every part.

Membranes, are Compages of fibres, expanded, to cover, or line any other part.

The arteries, are tubes that ariſe in two trunks from the two ventricles of the heart, and thence dividing into branches, diſtribute the blood to every part of the body.

VEINS, are tubes to return the blood from the extremities of the arteries to the heart.

LYMPHÆDUCTS, are pellucid tubes to carry lymph from all parts, eſpecially the glands, which they diſcharge into the larger veins, and into the Vaſa Lactea.

NERVES are Faſciculi of cylindrical fibres, which ariſe from the Medulla Oblongata of the brain, and the Medulla Spinalis, and terminate in all the ſenſitive Parts. They are the immediate organs of ſenſation.

A GLAND ſecretory, is compoſed of an artery, vein, lymphatic, excretory duct, and nerve. The uſe of glands is to ſecrete fluids from the blood for ſeveral uſes.

EXCRETORY-VESSELS, are either tubes from glands to convey the ſecreted fluids to their reſpective places, or veſſels from the ſmall guts, to carry the chyle to the blood-veſſels; theſe laſt, are call'd Vaſa Lactea.

MUSCLES, are diſtinct portions of fleſh, which, by contracting, perform the motions of the body.

TENDONS, are the ſame fibres of which the muſcles are compoſed; but white and more cloſely connected, that they may poſſeſs leſs ſpace in a limb, and be inſerted in leſs room into a bone.

LIGAMENTS, are ſtrong membranes, or bodies of fibres cloſely united, either to bind down the tendons, or give origin to the muſcles, or tie together ſuch bones as have motion.

CARTILAGES, or griſtles, are hard, elaſtic, ſmooth and inſenſible: Their uſe is to cover the ends of the bones that have motion, to prevent their attrition, &c.

BONES, are firm parts to ſuſtain, and give ſhape to the body.

THE hair and nails are ſufficiently known; the former ſeems to be nouriſhed from the Materia Perſpirabilis, and the latter from the Reticulum Mucoſum, betwixt the Cutis and Cuticula.

BOOK

BOOK I.

CHAP. I.

Introduction to the Bones.

THE uſe of the bones is to give ſhape and firmneſs to the body, to be levers for the muſcles to act upon, and to defend thoſe parts from external injuries that are of greateſt conſequence to be preſerved, as the brain, heart, &c.

THEY are in their firſt ſtate very ſoft fibres, till by the addition of a matter, which is ſeparated from the blood into them, they grow by degrees to the hardneſs of a cartilage, and then perfect bone: But this great change is neither effected in a very ſhort time, nor begun in all the parts of the ſame bone at once. Flat bones, that have their fibres directed to all ſides, begin to Tab. v. C. oſſify in a middle point; but thoſe that have their fibres nearly parallel, begin in a tranſverſe middle line, that is, in the middle of each fibre; and ſo the cylindrical bones in a middle ring, from which they ſhoot forth to their extremities. By the continual addition of this oſſifying matter, the bones increaſe, till their hardneſs reſiſts a farther extenſion; and becauſe their hardneſs is always increaſing while they are growing, the increaſe of their growth becomes ſlower and ſlower, till they ceaſe to grow at all; and at length in old or weak perſons, if I am not miſtaken in my obſervations, they decreaſe as well as the fleſhy parts, though not ſo faſt, by reaſon of their hardneſs. And though I think it would be difficult to prove this, yet the poſſibility of it at leaſt will ſufficiently appear from the following caſe. A ſoldier that from a ſhot in his left groin, had the head of the Os Femoris broke, part of which came away through the wound, upon which the limb waſted, and he dying of an Anaſarca about a year after, I found the Os Femoris waſted about an inch in length, but ſo much in its thickneſs, that when they were both dried and ſawed lengthways through their middles, the emaciated bone weighed thirty grains leſs than half the weight of the other thigh bone: From the appearance of this man, and the firm connection of all the bones with their Epiphyſes, I am perſuaded he muſt have done growing before he receiv'd this wound; therefore, unleſs he was taken lame into the ſervice, which cannot be ſuppoſed, this bone muſt have waſted about thus much in that time. The oſſifying matter of the bones is ſo well directed to them by ſome wiſe law, that I have ſeen but one inſtance of a bone in an adult body unoſſified, which was ſo much of one ſide of the lower jaw as is beyond the teeth; but bony excreſcences upon the bones are frequent, and even the fleſhy parts, eſpecially in old perſons, are ſometimes oſſified. In an old man that died of a mortification in his leg, I found all the arteries of the legs bony, eſpecially between the diviſions of the branches, and many parts of the Aorta. But the moſt conſiderable inſtance of this kind that I have ever found, is in part of the muſcular fibres of the heart of a man, nearer its Vertex than the baſe, as large as a ſixpence, perfectly oſſified. And though it might ſeem that the bones, while they appear cartilaginous, differ from perfect bones only in hardneſs, yet in a child two years old that I kept in vinegar, all the bones grew near as ſoft and pliable as the fleſhy parts, though the ſkin in ſeveral places was not taken off; yet the cartilages and cartilaginous Epiphyſes of the bones were but little altered. Tab. vi. F. 1.

BONES that are without motion, as thoſe of the ſcull, the Oſſa Innominata, &c. alſo bones with their Epiphyſes, when they meet, preſs into each other, and form ſutures, which ſoon diſappear in thoſe that join, while their oſſific matter is ſoft; but thoſe that grow harder before they meet, preſs more rudely into each other, and make more uneven ſutures, ſome of which in the ſcull endure to the greateſt age; and very often Tab. iii. F. 2.

the oſſific matter not flowing far enough to complete a bone, the part uncompleted has an oſſification begun in its center, and is formed into a diſtinct bone, which may happen to be of any figure. Theſe bones are ofteneſt found in the Tab. iii. 29. lambdoidal ſuture, and are called Oſſa Triquetra. But the ends or ſides of bones that are intended for motion, are hindered from uniting, by the cartilages which cover them; for when theſe Tab.vi. E. cartilages are deſtroyed they very readily unite; this diſtemper is called Anchyloſis.

The ends of all the bones that are articulated for very manifeſt motions, or that are not placed Tab. v. 1, 2, 3. againſt other bones, are tipped with Epiphyſes, or additional bones, which in ſome meaſure determine their growth and figure; for if they had nothing to give bounds to them, they would ſhoot out like the Callus from the broken ends of a bone that is not ſet, and grow more ragged than the edges of bones which are joined by Tab. ii. 16, 17. ſutures; and ſometimes Epiphyſes are made uſe of to raiſe proceſſes upon bones for the inſertions of muſcles, as the Trochanters of the thigh bones, where it would weaken the bones too much to have proceſſes raiſed out of their ſubſtance.

The fibres of bones, for ought that we can diſcover from experiments or microſcopical obſervations, appear to be connected to each other by the ſame means that the ſeveral parts of a fibre are connected, that is, by that ſtrong attraction which belongs to particles of matter in contact: But this coheſion of fibre to fibre is not equal to that in the parts of a fibre, though very nearly. Indeed, if it was, a bone would not be a ſtructure of fibres, but one uniform maſs, like that of any pure metal, the coheſion of the parts of which are every way alike: Nor are the parts of bones diſpoſed into Lamellæ, Stratum ſuper Stratum, as G—di, and others have painted; for though young bones may in ſome places be ſplit into Lamellæ, yet they not only appear one ſolid uniform maſs to the naked eye, but even with a microſcope, till we come to their inner ſpongy texture, which alſo appears uniform.

THE texture of the bones when firſt formed, is every where looſe and ſpongy, but as they increaſe, they become in many places very compact and denſe, which reſults in great meaſure from the preſſure of the bellies of the muſcles, and other incumbent parts; as appears from the impreſſions which are made on the ſurfaces of the bones, and the rough ſpines that riſe on the bones in the interſtices of the muſcles, which are very remarkable in the bones of men who have been bred up in hard labour. In thoſe parts of the flat bones that receive but little preſſure, the outer Laminæ only become compact and denſe, and the middle part remains ſpongy; but where the preſſure is great, they become one denſe body or table; and this preſſure is ſo effectual, that ſome parts of the Scapula, and the middle of the Ilium, are uſually thinner in an adult body than in a child before it is born. The cylindrical or round bones being preſſed moſt in their middle, become there very hard and ſtrong, while their extremities grow ſpongy, and dilate into Tab. v. D.

into large heads, which make ſtronger joints, and give more room for the origins and inſertions of the muſcles; and increaſe the power of the muſcles, by removing their Axis farther from the center of motion of any joint they move.

ALL the bones, except ſo much of the teeth as are out of the ſockets, and thoſe parts of other bones, which are either covered with cartilage, or where muſcles or ligaments ariſe or are inſerted, are covered with a fine membrane, which upon the ſcull is called Pericranium, elſewhere Perioſteum; one uſe of which is for the muſcles to ſlide eaſily upon, and to hinder them from being lacerated by the roughneſs and hardneſs of the bones. This membrane is ſaid to be exceeding ſenſible of pain, which, I ſuppoſe, is imagined from the pain that a blow on the ſhin gives; but it ſhould be conſidered how much greater the contuſion is in that caſe, from its lying upon a hard body; for this is certain, that when we cut this membrane, or ſeparate it from the bone, as we do, to prepare for the operation of the trephine; the patient never diſcovers any extraordinary uneaſineſs; and that great pain which is ſometimes felt at the ſawing the bones or a bone in an amputation, is when the teeth of the ſaw touch the great nerves that always lie near the bones, and not from the Perioſteum; for if it proceeded from that, this complaint would be more conſtant, and at leaſt as great at the firſt ſetting on of the ſaw, or at the laſt ſtroke, as at any other time.

In a body that I diſſected, who died of a ſpotted Fever, I found in many of the bones extravaſated blood; and in ſeveral places, particularly on the Os Humeri, and Os Femoris, a large quantity of blood between the Perioſteum and the bones. I imagine it may be from ſuch extravaſations of blood that carious bones ſometimes follow violent fevers, and the ſmall-pox.

In children that have died of the rickets, I have always found the nodes on the bones very ſpongy and bloody, and in one inſtance ſeveral of the bones as limber as leather, and the Perioſteum in many places ten times its natural thickneſs; but the cartilages in all that I have diſſected, have had no apparent alteration in their texture, though they were ſwelled to more than four times their natural bigneſs.

Every cylindrical bone has a large middle cavity, which contains an oily marrow, and a great number of leſſer cells towards their extremities, which contain a bloody marrow; this bloody marrow is alſo found in all ſpongy cells of bones. The uſe of the firſt kind of marrow is to ſoften, and render leſs brittle the harder fibres of bones among which it is ſeated; and the other marrow is to be of the ſame uſe to the leſs compact fibres, for an oily marrow might have made them too ſoft; and for this reaſon, there is leſs of the oily marrow, and more of the bloody in young bones than in old ones. Every one of theſe cells is lined with a fine membrane, and the marrow in the larger cells is alſo contained in thin membranous veſicles, in which membranes Tab.v. D.

branes I ſuppoſe thoſe veſſels lie that ſecrete the marrow; if the bones had been formed of the ſame quantity of matter without any cavities, they would if they were ſtreight be able to ſuſtain the ſame weight that they now can. But they being made hollow, their ſtrength ſo as to reſiſt breaking tranſverſly is encreaſed as much as their diameters are encreaſed, without encreaſing their weights; which mechaniſm being yet more convenient for birds, the bones of their wings, and for the ſame reaſon their quills, have very large cavities. But the bones in the legs of all animals are more ſolid, being formed to ſupport weight; and mens bodies being ſupported but by two limbs, the bones of their limbs, are therefore made more ſolid than thoſe of quadrupeds. But in a fractured bone, in which the ſame kind of matter that oſſified the bones at firſt, is thrown out from the ends of the broken bone, there is made a maſs of callous matter of equal ſolidity with any part of the bone, and of equal or greater diameter; which will make the ſtrength of the bone in that place greater than it was before: And if we conſider, we ſhall find this a very wiſe proviſion, for bones, when broke, are ſeldom or never ſet in ſo good a direction as that in which they were firſt formed, and therefore they would be more liable to be broke in the ſame place again, and would be reunited with greater difficulty, and ſometimes not at all, becauſe the Callus not being vaſcular, would ſcarce admit the oſſific matter to flow through it to form a new Callus.

THE names of the articulations of the bones being variouſly uſed by authors, and being but of ſmall conſequence, I give the ſhorteſt account that I can of them. An articulation for manifeſt motion, is called Diarthroſis; for obſcure motion, Synchondroſis; and that kind which is without motion, Synarthroſis.

DIARTHROSIS, is divided into two kinds, viz. Enarthroſis and Ginglymus. Enarthroſis is where a round head is received into a round cavity, which mechanicks call the ball and ſocket; though none of the articulations in a humane body fully reſemble that, unleſs the upper end of the thigh bone, with the Os Innominatum. Ginglymus is always deſcribed by authors to be where a bone receives, and is received; which is right, where they are joined ſomewhat like hinges, as the oblique proceſſes of the Vertebræ of the loins, where authors uſually take two joints to make a Ginglymus, that it may anſwer their deſcriptions, tho' any one of thoſe joints is a true Ginglymus. But in the other Vertebræ, and in the articulation of the Ulna, with the Os Humeri, and that of the Radius with the Ulna, there being only the motion of hinges, without the form to give theſe joints this denomination; we may for the ſame reaſon call every joint a Ginglymus, whoſe property is only to bend and extend, as the knee, ankle, &c. And what makes it more neceſſary to bring theſe joints under this head, is, that they are reducible to no other.

SYNCHONDROSIS, is by intervening cartilages or ligaments, as between the bodies of the Vertebræ; but the trueſt Synchondroſis is the joining of the ribs to the bone of the Sternum.

SYNARTHROSIS, is of two ſorts, viz. Sutura and Gomphoſis. The firſt kind is the mutual indentation of one bone with another, as is eminently ſeen in the ſcull, and the other the faſtening of the teeth in their ſockets, like a nail in wood.

CHAP. II.

Of the Sutures and Bones of the Head.

THOSE Sutures which have proper names, are here deſcribed; thoſe which have not, derive their names from the bones they ſurround, and are known by them.

Tab.iii. 1. SUTURA CORONALIS, runs acroſs the ſcull, and joins the parietal bones to the frontal.

Tab.iii. 2. SUTURA SAGITTALIS, joins the parietal bones; it begins at the Os Occipitis, and is continued to the Os Frontis; in children down to the noſe; the Os Frontis in them being two bones, and ſometimes ſo in adult bodies. Tab. v.

Tab.iii. 3. SUTURA LAMBDOIDALIS, joins the back part of the Oſſa Bregmatis, or parietal bones, to the upper part of the occipital: In this ſuture are frequently obſerved ſmall bones, called Oſſa Triquetra. Tab. iii. 29.

SUTURA SQUAMOSA, is made by the wrapping of the upper part of the temporal and ſphenoidal bones over the lower edges of the parietal bones. Tab. iii. 4.

SUTURA TRANSVERSALIS, runs acroſs the face, through the bottoms of the orbits of the eyes; it joins the lower edge of the frontal bone to the Os Sphenoides, Maxillæ Superioris, Oſſa Ungues, Palati, Plana, and Jugalia, or Malarum. Tab. iii. v.

THE ſcull being thus divided into many bones, is neither ſo ſubject to fractures, nor to have fractures ſo far extended, as it would have been were it compoſed of one bone only. This ſtructure is alſo convenient for the oſſification of the bones (as has been ſhewn in the firſt chapter) and for the birth, becauſe theſe bones not being perfect at that time, may be preſſed together and make the head leſs.

TEN of the bones of the head compoſe the ſcull to contain the brain. Theſe ſhall be firſt deſcribed.

OSSA PARIETALIA OR BREGMATIS, are two large bones which compoſe the ſuperior and lateral parts of the ſcull; on the inſide they are remarkably imprinted by the arteries of the Dura Mater. Tab. iii. 7. Tab. viii. 4.

OS FRONTIS, makes the upper and forepart of the Cranium; its lower parts compoſe the upper parts of the orbits of the eyes. On its inſide are impreſſed the external figure of the two Tab. iii. 6.

hemiſpheres of the brain. In thin ſculls this bone has uſually a large thin ſpine in the middle of the inſide, running from the Os Ethmoides towards the crown of the head; but in thick ſculls it is frequently wanting, and in very thick ones uſually a Sinus in its place; the uſe of this ſpine is to ſtrengthen thin ſculls. Immediately above the Os Ethmoides in this bone, is a ſmall blind hole, through which runs a vein into the beginning of the longitudinal Sinus of the Dura Mater; between the eyebrows in this bone, are two or three large Sinuſes, and ſometimes four or five, which lead into the noſe; and on the upper edge of each orbit, a ſmall perforation, or a notch, through which nerves and an artery paſs ſecure to the forehead: It has alſo a ſmall hole in each orbit near the Os Planum, through which paſſes a branch of the fifth pair of nerves. The Sinuſes and ſpine in this bone make it very dangerous, if not impracticable, to apply a trephine on the middle and lower part of the forehead.

OS ETHMOIDES or CRIBRIFORME, is a ſmall bone about two inches in circumference, ſeated in the arterior part of the baſis of the ſcull, being almoſt ſurrounded by the laſt deſcribed bone; it is full of holes like a ſieve, through which it is ſaid the olfactory nerves paſs, which I could never diſcover. In its middle ariſes a large proceſs named Criſta Galli: And oppoſite to this a thin one which in part divides the noſe. The greater part of the Laminæ Spongioſæ in the noſe, belong to this bone. Tab. viii. 23.

Os Sphenoides, is of a very irregular figure; Tab. iii. 14. it is ſeated in the middle of the baſis of the ſcull, bounded by the Os Frontis, Ethmoides, Vomer Occipitis, Maxillæ Superioris, Oſſa Parietalia, Palati, Malarum, Temporum, and Petroſa, which are parts of the former bones. Tab. viii. 18. In its inſide next the brain is a cavity, named Sella Turcica, which is bounded by four proceſſes, called Clinoides; and oppoſite to the Sella Turcica is a proceſs which makes part of the Septum Narium. On the outſide of the ſcull adjoining to the upper jaw, are two proceſſes of this bone on each ſide, named Pterygoides, from which ariſe one on each ſide near the palate, having no name; Tab. iv. B. 10. over which are reflected the tendons of the Pterygoſtaphylini Externi muſcles; and nearer towards the Occiput, between theſe and the Styloid proceſſes of the Oſſa Petroſa, ariſe two more ſmall rugged proceſſes; and under the Sella Turcica in this bone, is a Sinus or two which open into the noſe, and in ſome ſculls only ſuch a ſpongy ſubſtance as is ſeen in the ends of ſome of the bones. At the inſide of the baſis of the two anterior clinoid proceſſes are two round holes, which are the firſt Foramina of the ſcull; thro' theſe the optick nerves paſs; almoſt under theſe, towards the Sides of the ſcull, are two irregular ſlits, named Foramina Lacera, or the ſecond Foramina of the ſcull, through which paſs nerves and blood-veſſels into the orbits of the eyes; and under theſe towards the Occiput are two round holes, which are the third Foramina, through which paſs nerves to the face. About half an inch

nearer the Occiput, are two more of an oval figure,
Tab. iv. which are the fourth Foramina, through
B. 11. which paſs the largeſt branches of the fifth pair of
nerves; and a ſtraw's breadth farther two very
ſmall ones, called the fifth Foramina, through
Tab. iv. which thoſe branches of the carotid arteries enter
12. that are beſtowed upon the Dura Mater. Between
this laſt deſcribed bone and the Oſſa Petroſa,
Tab. iv. are two large rough holes, in which I have
13. ſeen large veins; and from theſe holes through
part of the Os Sphenoides, under the Pterygoid
proceſſes are ſmall holes, through which paſs
nerves and arteries to the back part of the noſe.

Tab. iii. 9. OSSA TEMPORUM, are ſituated below the
parietal bones, at the middle and lower parts of
the ſides of the ſcull; they have each at their
Tab. iii. back-parts, one large proceſs, called Mammillaris,
10. or Maſtoideus, and from the lower and middle
Tab. iii. parts of each a proceſs which joins the Oſſa
13. Malarum, named Jugalis or Zygomaticus.

OSSA PETROSA, lie between the former
bones and the occipital bones, or are truly portions
of the former bones, being never found ſeparate
in adult bodies. They have each on their
Tab. iii. outſide one long ſlender proceſs, called Styliformis,
12. and from the ſide of this proceſs a Foramen,
which runs obliquely forwards into the
Tab. iv. ſcull; theſe are the ſixth Foramina; and one Foramen
B. 5. in the inſide of the ſcull leading to the organs
of hearing, which are the ſeventh Foramina.
Tab. viii. The ridge on the upper parts of each of theſe
15. bones in the inſide of the ſcull, as alſo on each
ſide raiſed by the Os Frontis and Sphenoides,

help to keep the brain ſteady, (ſee chapter of the Dura Mater) and are admirable ſupports to the thin and flat parts of the ſcull, which elſe would be exceeding weak. (For what remains of this bone, ſee chap. Of the organs of hearing.)

BETWEEN the laſt deſcribed bones, and the following bone, are two large holes, which are the eighth Foramina. Through theſe holes paſs the Par Vagum and Lateral Sinuſes; ſometimes there are two on each ſide, one for the nerve, and one for the Sinus. To theſe we may add another very ſmall one on each ſide, through which paſs the Portiones Duræ of the auditory nerves; and ſometimes there is another for an artery. Tab. iv. 14.

OS OCCIPITIS, makes all the back-part of the ſcull; it is bounded by the ſphenoidal, temporal, petroſal, and parietal bones; it has two ſmall Apophyſes, by which it is articulated to the ſpine; near thoſe Apophyſes are two ſmall Foramina, which are the ninth of the ſcull; through theſe paſs the ninth pair of nerves; and between theſe is the great, or tenth Foramen, through which the Medulla Oblongata deſcends into the ſpine, the cervical arteries enter, and the cervical veins and tenth pair of nerves paſs out. In the inſide of this bone is a crucial ſpine impreſſed by the longitudinal and lateral Sinuſes; and on the outſide oppoſite to the middle of this ſpine, in ſome bodies, is an Apophyſis, and from that down to the great Foramen, a ſmall thin ſpine. The ſpines in this bone are of the ſame uſe with thoſe in the Os Frontis, &c. viz. to ſtrengthen it, which they do here in a greater degree than Tab. iv. 2. Tab. viii. 9. Tab. viii. 10. Tab. iv. B. 15. Tab. viii. 7.

in any other bone of the ſcull. The thinner parts of this bone are alſo defended by the muſcles that cover them. This proviſion is very neceſſary, becauſe we can leaſt defend this part, and blows here are of worſe conſequence than on any other part of the ſcull, becauſe wounds in the Cerebellum, which is underneath, are mortal. There is in moſt ſculls, a Foramen behind each Apophyſis of the occipital bone to the eighth Foramen; through which paſs Sinuſes, from the lateral Sinuſes, to the external cervical veins: By means of theſe communications, as in all other communications of the Sinuſes, the blood paſſes from thoſe that happen to be ſurcharged by any poſture of the head, into thoſe that from the ſame poſture would elſe have been almoſt empty. Such ſculls as want theſe Foramina, have two Sinuſes for the ſame purpoſe within the ſcull.

THE remaining bones of the head compoſe the face, orbits of the eyes and the jaws.

Tab. iii. 16. OSSA NASI, are ſmall oblong bones which make the upper part of the noſe; they make that kind of arch which is fitteſt to ſuſtain ſuch injuries as the noſe is moſt expoſed to.

Tab. iii. 15. OSSA MALARUM, theſe bones compoſe the cheeks, and the anterior, lower and outer parts of the orbits of the eyes; they have each a ſhort proceſs, which proceſſes join the Proceſſus Jugales of the temporal bones, and form arches which by ſome Authors, have been called Oſſa Jugalia.

Tab. iii. 17. OSSA UNGUES, are ſmall bones about as large as thumb nails, ſeated immediately below the Os Frontis towards the noſe in the orbits of the eyes, whoſe anterior and inner parts they help to compoſe; and between each of them and the upper jaw is a Foramen as large as a gooſe quill, into which the Puncta Lacrymalia lead, to carry off any ſuperfluous moiſture from the eyes into the noſe. Tab. iii. 19.

Ossa Plana, are thin ſmooth bones ſeated immediately beyond the foregoing bones, in the orbits of the eyes, and are near thrice as big. They are indeed, but ſmooth ſurfaces of the Os Spongioſum, and not diſtinct bones. Tab. iii. 18.

Maxilla Superior, is always deſcribed ſingle, though it is manifeſtly divided by a ſuture which is ſcarce ever wholly obliterated. It runs up with two proceſſes to the Os Frontis between the Oſſa Naſi and Ungues, and another, which joins to the cartilage of the Septum Naſi. Its upper and outward parts make the lower parts of the orbits of the eyes; its lower ſide, all that part of the face under the cheeks, eyes, and noſe to the mouth, and two thirds of the roof of the mouth. A little below the orbits of the eyes, in this bone, are two holes, and behind the Dentes Inciſores one more, which divides into two, as it opens into the noſe, one on each ſide the Septum Naſi. Between the poſterior grinding-teeth and the orbits of the eyes are two great Sinuſes, called Antra Maxillæ Superioris: and in the lower edge of this jaw are the Alveoli, or ſockets for the teeth. Part of the ſides of theſe cavities, that lie next the noſe, are only membranes which make the cavities like drums, perhaps to give a grave ſound to the voice when we let part of it Tab. iii. 20. Tab. iii. 21.

through the noſe; but brutes not needing ſuch variety of ſounds, have theſe cavities filled with Lamellæ, which are covered with membranes in which the olfactory nerves terminate, for a more exquiſite ſenſe of ſmelling, than is neceſſary for men.

I HAVE ſeen an impoſthumation from rotten teeth in one of theſe cavities, which has been cured by drawing ſome of the laſt grinding-teeth, and by making a perforation into it through their ſockets. Mr. Cowper has admirably deſcribed this caſe. The ſigns of it are rotten teeth, ſtinking breath, and great pain about the part. The drawing one or two of the laſt grinding-teeth, generally, if not always, in this caſe, opens a paſſage into the Antrum; but if not, or if the paſſage is not large enough, it may be made or enlarged with a carpenter's nail-piercer or gimblet, which is as good an inſtrument as can be for the purpoſe.

OSSA PALATI, are two ſmall bones that make the back part of the roof of the mouth, and a ſmall part of the bottom of each orbit, unleſs theſe portions may be accounted diſtinct bones. Between the Oſſa Palati and the Os Maxillare near the pterygoid proceſſes of the ſphenoidal bone, are two ſmall Foramina, through which arteries and nerves paſs to the palate.

Tab. viii. 24. OS VOMER, is ſeated between the bones of the palate, and the ſphenoidal bone. It is alſo joined to the proceſs of the Ethmoides, and part of the lower jaw. Its fore-part is ſpongy, and is continued to the middle cartilage of the noſe. This bone and cartilage are the Septum Naſi.

OS SPONGIOSUM, is uſually treated as a diſtinct bone, though it is only the ſpongy Laminæ in the noſe, of the Os Ethmoides and Oſſa Plana, but chiefly of the Os Ethmoides, to which it always adheres. In conſidering theſe Lamellæ as a diſtinct bone, we follow the ancients, who did not diſtinguiſh the bones of the ſcull only, as they are divided by Sutures, but according to the differences of their texture, figure, ſituation, or uſe. Thus they called theſe parts, Os Spongioſum; a proceſs of the temporal bone, joined to the Os Malæ, Os Jugale; the temporal bone, which is one with the Petroſum in adults, Os Temporis, becauſe it is ſeated under the temples; and the other parts, Os Petroſum, from its hardneſs or ruggedneſs; and the upper jaw one bone, though it is always two.

MAXILLA INFERIOR, is articulated with Tab. iii.
looſe intervening cartilages to the temporal 22.
bones, by two proceſſes, named Condyloides. Tab. iii.
Near theſe ariſe two more, very acute, called 24.
Coronales, and at the inſide of the chin a ſmall Tab. iii.
rough Proceſſus Innominatus. In the inſide of 23.
this bone under each Proceſſus Coronalis, is a large Foramen which runs under the teeth
through this bone, and paſſes out at the chin. Tab. iii.
In this Foramen or chanel, the veſſels paſs 25.
that belong to the teeth; and in the upper edge of this jaw are the Alveoli, or ſockets for the teeth.

Tab. iii. DENTES, the teeth ſeldom exceed ſixteen in each jaw; the four firſt in each are called Inciſores, the two next Canini, and all the reſt Molares; the four laſt of theſe are named Dentes Sapientiæ, becauſe they do not appear till men arrive at years of diſcretion. The Inciſores and Canini have only one ſingle root, but the Molares more; the eight firſt, two; and the reſt, ſome three, ſome four; eſpecially in the upper jaw, becauſe the upper jaw being more ſpongy than the other, the teeth need more fangs to fix them. Each of theſe fangs, or roots, has a Foramen, through which paſs an artery, vein, and nerve; which are expanded in a fine membrane lining a cavity in each root of a tooth. This membrane is the ſeat of the tooch-ach.

THE teeth of children caſt off while they are growing; but the ſucceeding teeth ariſe in new ſockets, and larger than the former; for the jaws increaſing faſter than the teeth, muſt otherwiſe of neceſſity have left chaſms between them, ſuch as there are in the mouths of brutes; but where teeth are drawn in adult bodies, the ſockets cloſe, and new teeth very rarely ariſe.

CHAP. III.

Of the Bones of the Trunk.

THE bones of the trunk are thoſe which compoſe the ſpine or chain of bones from the head down to the rump, the ribs and Sternum.

THE ſpine, is compoſed of twenty four Ver- Tab. i. ii. tebræ, (each of which in a young child is three bones) beſides thoſe of the Os Sacrum and Coccygis; ſeven belong to the neck, the firſt of which is called Atlas, the ſecond Dentata, from Tab. iv. G. a proceſs in that bone bearing the ſame name; twelve to the back, five to the loins: The Os Tab. iv. H. 1. Sacrum is ſometimes five, ſometimes ſix bones, and the Os Coccygis four. If this chain had been compoſed of fewer bones, they muſt have either not been capable of bending ſo much as they do, or have bent at leſs obtuſe angles, which would have preſs'd the ſpinal marrow.

IN all theſe Vertebræ, except the firſt, is a Tab. iv. H. I. K. 1. middle anterior ſpongy body, by which they are firmly articulated with a very ſtrong intervening ligament; and from the middle of the hind part of each, except the firſt, ſtands a proceſs named Spinalis, and from every one a proceſs on each 4. ſide, called Tranſverſalis, and two ſuperior, and 2. two inferior ſhort ones; by which the back parts

3. of the Vertebræ are articulated, named Obliqui, Superiores, and Inferiores.

The fore-part of the ſeven Vertebræ of the neck, and two upper of the back, are flat forwards, to make room for the Aſpera Arteria and Gula: The third and fourth of the back very acute, to give way to the diviſion of the veſſels of the lungs and heart, and bent to the right ſide for the ſituation of the heart, which makes that ſide of the breaſt ſomewhat more convex than the other, and therefore I think ſtronger; which is an advantage to the right arm, becauſe its motions depend upon the ſupport it receives from the breaſt.

Hence, I think, it ſeems that the almoſt univerſal preference of that arm is not an arbitrary thing, but founded upon obſervation, that it is capable of more perfect actions than the other.

The ſpinal proceſſes of the ſecond, third, fourth and fifth Vertebræ of the neck are forked, the two laſt of the neck long and horizontal, the three or four upper ones of the back like them, only a little declining, the middle ones of the back run obliquely downwards, and the proceſſes of the remaining Vertebræ become ſucceſſively thicker, ſtronger, and leſs declining; thoſe of the loins being horizontal, like the laſt of the neck. The muſcles that are inſerted into the ſpinal proceſſes of the Vertebræ of the neck and loins, will act with more ſtrength than thoſe of the back, becauſe their proceſſes being perpendicular to the ſpine, they are longer leavers; beſides,

ſides, thoſe of the back touch one another, and prevent much motion, becauſe it would interrupt reſpiration; and much motion being neceſſary in the neck and loins, their proceſſes are made fit for it.

THE tranſverſe proceſſes of the Vertebræ of the neck are perforated, for the admiſſion of the cervical blood-veſſels, and bowed downwards, and hollowed, for the paſſage of the cervical nerves. The eight or nine upper ones of the back, receive the upper ribs; and the reſt, with thoſe of the loins, ſerve only for origins and inſertions of muſcles. The ſhape of the ſpine is like an Italick *ſ* bending inwards at the loins, and outwards at the ſhoulders; therefore when women that are either very young or very weakly, breed, the child by a continual preſſure againſt the loins, makes them ſtreighter, which neceſſarily makes the ſhoulders or back ſo much more convex, and the preſſure upon the abdominal muſcles at the ſame time bringing the ribs downwards, they grow round-ſhouldered and flat-breaſted.

OS SACRUM has two upper oblique proceſſes, ſome ſmall ſpinal proceſſes, and two Foramina in each interſtice of the bones it is compoſed of, both before and behind. Tab. ii. 13.

OS COCCYGIS has none of theſe parts.

THROUGH every bone of the ſpine, the Os Coccygis excepted, is a large Foramen, which together make a chanel through the ſpine, in which is contained the Medulla Spinalis; and in each Tab. ii. 14.

each ſpace between the Vertebræ are two large holes for the nerves to paſs out.

'Tis worth conſidering, the proviſion that is made to prevent luxations in this chain of bones, ſuch luxations being worſe than any other becauſe of the ſpinal marrow which is contain'd within theſe bones. The bodies of the Vertebræ are all in the ſame manner connected by ſtrong intervening ligaments or cartilages. In the neck the oblique proceſſes of the received bone are wrapped over thoſe of the receiving bone, which forbids their luxating forwards. The tranſverſe proceſſes with a ſmall Apophyſis of the body of the ſame bone, in like manner, ſecures 'em from ſlipping backwards, and an Apophyſis on each ſide of the body of the receiving bone, hinders them from ſlipping to either ſide. The Vertebræ of the back are hindered from diſlocating forwards by the ſame proviſion with thoſe of the neck; and from luxating backwards, by the ribs which are faſtened to the tranſverſe proceſſes of the inferior Vertebræ, and againſt the back-part of the body of the next ſuperior; they alſo hinder them from diſlocating to either ſide; but the ribs at the two or three laſt Vertebræ of the back are not fixed to the tranſverſe proceſſes, and therefore it is that luxations are moſt frequently ſeen in this part; but the Vertebræ of the loins are received into deep cavities, and are tyed with much ſtronger ligaments for their ſecurity. Each joint of the Vertebræ, except the two uppermoſt, has two centers of motion, one upon the bodies of the Vertebræ, when the body is bowed forwards;

and the other at the articulations of the oblique proceſſes, when the body is bowed backwards; from which ſtructure the extenſors will have about twice the leaver to act with, and conſequently twice the power to raiſe the trunk into an erect poſture, that they have to carry it beyond that poſture; for then the oblique proceſſes begin to be the centre of motion, and give the ſame advantage to moſt of the benders. Without this contrivance it would have been more difficult, if poſſible, to have kept the body erect for any length of time, or to have recovered an erect poſture with conſiderable ſtrength after a bend of the body.

THE ribs are twelve in number on each ſide; Tab. i. ii. the ſeven uppermoſt are called true ribs, becauſe their cartilages reach the Sternum; and the five loweſt are called baſtard-ribs. They are articulated to the bodies of the twelve Vertebræ of the back, and all except the two or three laſt are articulated to their tranſverſe proceſſes, and the under ſide of the middle ribs are hollowed for the paſſage of the intercoſtal veſſels. They defend the parts contained in the breaſt, and when they are drawn upwards, the cavity of the breaſt is enlarged for inſpiration, and ſo the contrary. In two children which I have diſſected, I found the ribs broke inwards, and on the outſide a plain print of a thumb and four fingers, which had been made by their nurſes hoiſting them up on one hand, taking hold of their breaſts, which being very often repeated, had broke the ribs inwards like a green ſtick, without ſeparating the broken ends of them; and I have very frequently ſeen the ſhape of childrens breaſts quite ſpoiled by ſuch tricks, which has occaſioned weakneſs of body, crookedneſs, and other Diſeaſes.

Tab.i.2. STERNUM, or breaſt-bone, is generally made up of three ſpongy bones, ſometimes more; to this the true ribs are articulated by their cartilages. See chapter of the cartilages.

Tab.iv.C. OS HYOIDES (I chuſe to mention it in this place, becauſe I know none more proper among the bones) is a ſmall bone at the root of the tongue; it ſerves only for muſcles to ariſe from, and be inſerted into. It is made of three bones, the middle one is called Baſis, the other Cornua.

1. I HAVE ſeldom found fewer than four and twenty Vertebræ in the ſpine, beſides the Os Sa-
2. crum, but often more; ſometimes thirteen of the back, with as many ribs of a ſide; and ſometimes ſix in the loins: And in ſome bodies two ribs from the firſt Vertebra of the loins; but then it has wanted tranſverſe proceſſes.

A WOMAN in the hoſpital with the venereal diſeaſe, having ſeveral bones carious, among the reſt two of the Vertebræ of the neck had their ſpongy bodies corroded, which ſeparating from their other parts while ſhe was in a ſalivation, her head could no longer be ſuſtained, but bowing forward, the ſpinal marrow was compreſſed and ſhe died ſoon after.

CHAP.

CHAP. IV.

Of the Bones of the upper Limbs.

CLAVICULA, is of the figure of the Italick *ſ*, one end is articulated to the Sternum, and the other to the Proceſſus Acromion of the Scapula; it ſerves to fix the Scapula, and to determine its motions. This bone is oſſified as early as any bone in the body, and is the ſooneſt united when broken. Tab. i. 3. ii. 3.

SCAPULA, its parts are the Acetabulum, which is a ſhallow cavity to receive the Os Humeri: A large ſpine from whoſe fore-part ſtands a proceſs called Acromion, and another proceſs from the fore-part of the upper edge of the Scapula named Coracoides; its upper edge is named Coſta Superior, and its lower one Coſta Inferior, and the poſterior edge its Baſis. I have ſeen a Scapula of a man which Dr. Douglaſs diſſected, in which the inſide of the Acetabulum Scapulæ was broke all to pieces, and the Os Humeri diſplaced; which fracture, I believe, could not by any means be certainly known while the Man was living, or if it could have been known, could not have been cured; yet I doubt not but the ſurgeon, whoever he was, did not eſcape cenſure for not making a cure. Tab. ii. 4. Tab. ii 5.

WHENEVER the Proceſſus Acromion is broke, the arm can never after be raiſed to advantage; for no care of the moſt ſkilful ſurgeon can reduce ſuch a fracture; for the Deltoid muſcle will draw the ends of the broken proceſs aſunder, and will want a middle fixed place to act from.

Tab i. 5. ii. 6. OS HUMERI, this bone has at its upper end a round head for its articulation, and near that an Apophyſis, which is divided by a Sulcus, in which runs a tendon of the Biceps Flexor Cubiti. At its lower end are two Apophyſes, named the outer and inner. Between theſe Apophyſes on the fore-part of the bone, is a ſmall Sinus, which receives a protuberance of the Ulna, and behind a large and deep one, which receives the Olecranon of the Ulna. This bone being more liable to be broke by a blow than any other way, and it being uncertain where that ſhall fall, it is made of almoſt equal ſtrength through the whole length of it; and its lower end having a very ſmall joint, for the ſake of a quick motion, the Sinuſes are formed there, to receive the proceſſes of the Ulna, to prevent diſlocations.

Tab. i. 7. ii. 8. Tab. ii. 9. ULNA, at its articulation to the former bone has two proceſſes, one large and thick, named Olecranon, and one ſmall one, named Proceſſus Anterior, and at the lower end of this bone is a ſmall proceſs, named Styloides.

WHEN about two inches or leſs of this bone is broke off at the lower end, it is ſcarce poſſible to raiſe it into its natural ſituation till the arm be turned prone; becauſe in a ſupine poſture the tendon of the Tenſor Ulnaris rides over it, and preſſes it down.

Radius is received at the upper end by the Os Humeri and Ulna; at its lower end it receives the Ulna and Carpus. By its turning upon the Ulna, are performed the prone and ſupine motions of the cubit. About an inch below its upper end is an extuberance for the inſertion of the Biceps muſcle.

Tab. i, 6, ii. 7.

Carpus the wriſt, is compoſed of eight bones of irregular figure; they are diſtinguiſhed into four of the firſt order, and four of the ſecond. The two firſt of the firſt order are articulated with the Radius, the firſt of the ſecond order is articulated to the thumb, and the remaining three to the metacarpal bones. The inſide of theſe bones leave a ſemilunar cavity for the tendons of the muſcles which bend the thumb and fingers to paſs through. What other reaſons there may be for this particular compoſition of bones, I know not; but this is plain, that by being moveable, one among another, they gradually give way, and leſſen the ſhock which any force againſt the hand would give, as the box of ſprings does the jolting of a coach, and thereby make the force leſs in each moment of time upon every bone of the arm, which greatly preſerves them from breaking; and the Scapula being fixed by muſcles, contributes very much to this purpoſe. This is an advantage that cannot be exactly computed; but it is certainly very great.

Tab. iv. M. 1, 2, 3, 4, 5, 6, 7, 8.

Metacarpus, is compoſed of four bones.

Tab. iv. M. 9.

Pollex, the thumb is made of three bones.

Tab. iv, M. 10.

Tab iv. M. 11. Digiti, the fingers are each compoſed of three bones. For the figure of theſe, ſee the Table, which will give a better idea of them than a verbal deſcription.

CHAP. V.

Of the Bones of the lower Limbs.

Tab. i. 11. ii. 12. Os Innominatum, is, before puberty, compoſed of three bones; the uppermoſt is named Ilium, the lower and anterior Os Pubis, the lower and poſterior Os Iſchii. The upper edge of the Ilium is called its ſpine, the anterior part of the ſpine its Apex, and lower than this is the Proceſſus Innominatus. The Iſchium has two proceſſes, the one called Acutus, the other Obtuſus. In the center of theſe bones is the Acetabulum, or ſocket, to receive the thigh-bone; in the bottom of which ſocket is another cavity, in which lies the lubricating gland of this joint; Tab. i. 19. and between the Os Iſchium, and Os Pubis, is a large Foramen.

Tab. i. 12. Os Femoris, at its upper end has a round head which is received into the Acetabulum of the Os Innominatum. A ſmall diſtance from this Tab. i. 13. ii. 17. are two proceſſes, named Trochanter Major, and Tab. ii. 17. Trochanter Minor. The ſpace between the greater proceſs and the head of this bone is called its neck, and from the leſſer Trochanter down the back-part of this bone till within four or five inches of the lower end, is a ridge, called Linea Aſpera. At the lower end of this bone are two Apophyſes, one exterior, and one interior. The chief uſe of the Linea Aſpera is, to ſtrengthen the thigh-bone; it is therefore ſo ordered, that it is always large, proportionably to the bend of the thigh-bone, and largeſt in that part of every thigh-bone that is moſt bent.

In two bodies which I have diſſected, I have found this bone broke at its neck, and by that means the limb ſhortened, and the caſe miſtaken for a luxation of the hip; and if we conſider the depth of this articulation, and the wonderful ſtrength both of the muſcles and ligaments, we cannot but ſuſpect that this bone is much oftener ſo broke, than out. This is certain, that if by an external accident the thigh is made ſhorter, and yet is uſeful, that muſt needs be from a fracture, and not a diſlocation; for it cannot be, that the head of the thigh-bone ſhould form itſelf a ſocket among the muſcles, to bear the whole weight of the body: Or ſuppoſing this could happen, though it is contrary to what we know in other like caſes, yet even then we muſt have new muſcles made, or theſe we have altered; for their directions with the thigh-bone being changed, their uſes would too, and almoſt all pull to the ſide contrary to which the bone is diſlocated. Tab. iv. G, H.

It often happens, that from a flux of humours upon the hip, this joint appears diſlocated; for when it is attended with pain, the muſcles contracting alter the poſture of the limb, and make it appear ſhorter, as the limb which is lifted from the ground is when we ſtand on one leg: But if the fluxion is without pain, the muſcles relax, and the limb falls into the ſame figure, which that limb is in, which we ſtand on in that poſture, and appears longer; which makes the common way of comparing of the limbs a very uncertain, if not impoſſible way to diſcover the caſe; therefore to know certainly, apply a ſtraight rule from the Apex of the ſpine of one hip to that of the other, then from the middle of that rule draw a perpendicular line between the legs, then meaſure the limbs at that line in the ſame plane, and if their Lengths are equal, they are moſt certainly right.

Tab.i. 14. PATELLA, the knee-pan, is ſeated upon the joint of the knee; its uſe is for the extenſors of the Tibia to be inſerted into, leſt paſſing over that joint, they might be too much expoſed to external injuries; it alſo gives an advantage to the muſcles, by removing their Axis farther from the center of motion of the knee.

Tab.i. 18. ii. 18. TIBIA, the ſhin-bone is in its middle almoſt triangular, which it ſeems to owe to the preſſure of the muſcles, for it is cylindrical in a Fœtus. In its upper end are two ſhallow ſockets, between which is a proceſs for the croſs ligament of the knee to ariſe from; a little below its Head is another proceſs, to which the ligament of the Patella is fixed, and at its lower end another, which makes the inner ankle.

A BOY of ſeven Years old was brought to me with both the Epiphyſes at the upper ends of the

Tibiæ, ſo far ſeparated from the Tibiæ, that not more than half each Tibia was joined to half the Epiphyſis, which made the legs wholly uſeleſs. This had been occaſioned by the nurſe holding him out to ſtool by the heels and back, when very young, which is among them too common a practice. I diſſected the leg of a man that had broke the Tibia through the fleſh, by a fall from the top of a houſe; no extenſion that was made moved this compound fracture at all, which I afterwards found to be occaſioned by a ſimple tranſverſe fracture above, which always gave way to the extenſion; that bit of bone whoſe end came through the ſkin, being diſcontinued from the parts by which the extenſion was made. In the foot of the ſame Leg, four of the bones of the Tarſus were cracked, two more of them, viz. the Os Calcis and Naviculare, had large pieces ſeparated, which were broke into a maſh; and all this without any diſlocation among theſe bones, or any the leaſt external wound or bruiſe.

FIBULA, is a long ſmall bone, its upper end is articulated to the outſide of the Tibia, an inch below its joynt, and the lower end makes the outer ankle, and part of that joynt; its chief uſe is for origins of muſcles; for it has no ſhare in ſupporting the body. A ſtrain of the worſt kind happens often to this joynt from the mighty force of the Peronei muſcles, when we endeavour to prevent a fall; for they being turned over the end of the Fibula, as on a pulley, part of their force lies againſt this bone, and ſtrains the ligaments that hold it, and ſometimes the bone it ſelf is Tab.i.16. ii. 19.

broke by them; which wants no care to ſet, and can ſeldom be diſcovered till the ſwelling is fallen.

Tab.iv.L. 1, 2, 3, 4, 5, 6, 7. TARSUS, is made up of ſeven bones, which are called Aſtragalus, Os Calcis, Naviculare, Cuboides, Cuneiforme, Majus, Medium, and Minimum. The bones of the Tarſus have the ſame kind of elaſtick ſtructure with thoſe of the Carpus, and for the ſame ends, but in a much greater degree; becauſe here the whole body is ſuſtained. This ſort of contrivance, and the uſe of it, are both very evident in the laſt joynts or paſterns of the legs of horſes; for horſes that have long paſterns, and much elaſtick motion in them, muſt neceſſarily trot high, and yet they always trot eaſie; but a horſe with ſhort paſterns, that trots high, always trots hard.

AN old man that had the under part of the Os Calcis laid bare as large as a half-crown, by a mortification, being brought to the hoſpital about two years after the bone was firſt bare, and all endeavours to ſcale it having proved ineffectual, I pared it with a chiſel till the bone bled, and it covered with granules of fleſh, in about three days, and afterwards healed very eaſily.

Tab. iv. L. 8. METATARSUS, is compoſed of four bones.

Tab. iv. L. 9. POLLEX PEDIS, is compoſed of three bones.

Tab iv. L. 10. DIGITI PEDIS, each is compoſed of three bones, but the two laſt of the little toe often grow into one.

FOR the figure and ſituation of theſe bones, ſee the table.

OSSA SESAMOIDEA, are ſaid to be found to the number of forty-eight: But we commonly find no more in the feet than two under the ball of each great toe; and in the hands ſometimes Tab. iv. D. two very ſmall ones at the middle joynt of each thumb; and ſometimes one at the lower end of Tab.iv.E. each thigh-bone at the beginning of the Plantaris muſcle. Their uſe is the ſame with the Patella. Tab.iv. F.

I FIND alſo in ſome bodies the little cartilages at the receiving ends of the bones of the fingers oſſified; which ſurely thoſe authors reckon among the Seſamoid bones, who ſay they are found to the number of forty-eight.

CHAP. VI.

Of the Cartilages.

EVERY part of a bone which is articulated to another bone for a ſliding motion, is covered or lined with a cartilage, as far as it moves upon, or is moved upon by another bone in any action; for cartilage being ſmoother and ſofter than bone, it renders the motions more eaſy than they would have been, and prevents the bones wearing each other in their actions. Theſe cartilages in the largeſt joynts are as thick as a ſhilling, and in the ſmalleſt as thin as paper.

IN the forepart of each articulation of the lower jaw, there is a looſe cartilage upon which the condyloid proceſs moves on one ſide, while the jaw is moved to the other; and the two proceſſes being thus raiſed at once, the jaw is thruſt forward.

In the joynt of the knee are two looſe, almoſt annular cartilages, which being thick at their outer edges, and thin at their inner ones, make the greateſt parts of the two ſockets in this joynt. The uſe of theſe cartilages is to make variable ſockets to ſuit the different parts of the lower end of the Os Femoris, for none but a round head and a round cavity can ſuit in motion, unleſs the ſhape of one or the other alters; and it is plainly neceſſary, that this lower end of the Os Femoris, ſhould be flattiſh, and projected backward, to give advantage to the muſcles that extend the Tibia, by ſetting the center of motion backward; which mechaniſm, though it equally leſſens the power of thoſe muſcles which bend this joynt, is yet of great ſervice, becauſe the extending muſcles move this joynt under the weight of the whole body, but the flexors only raiſe the legs; and as no head or ſocket moves ſo eaſily as round ones, here ſeems to be ſome proviſion made againſt the inconvenience of a flattiſh head and cavity, by having the friction made upon two ſurfaces, the Os Femoris upon the looſe cartilages, and the looſe cartilages upon the Tibia. This contrivance is always found neceſſary by mechanicks, where the friction of the joynts of any of their machines is great, as between the parts of hook-hinges of heavy gates, and between the male and female ſcrews of large vices, where they always place a looſe ring.

THERE are other cartilages which ſerve to give ſhape to parts. Of this ſort are the ciliary cartilages at the edges of the eye-lids, the cartilages of the outer ears, and thoſe which compoſe the lower part of the noſe, which have this particular advantage in theſe places, that they ſupport and ſhape the parts as well as bones do, and without being liable to be broke.

THE ribs have cartilages of a conſiderable length, which articulate the ſeven uppermoſt, and ſometimes eight on each ſide to the Sternum; which cartilages being very pliable, ſuffer the ribs to move eaſily in reſpiration, and the body to twiſt or bend to either ſide without difficulty. But the cartilages of the lower ribs do not reach the Sternum. And at the bottom of the Os Pectoris or Sternum, is a cartilage which is named from its commoneſt figure, Enſiformis. Tab.i. 20.

THERE are other cartilages which compoſe the Larynx and Aſpera Arteria. The Larynx is formed of five: The foremoſt is like a ſaddle, but is named Thyroides; behind this are two called Arytænoides; they compoſe the Rimula of the Larynx. Over theſe is the Epiglottis to cover the Rimula while the aliment paſſes to the Pharynx; and under them one like a ſeal ring, named Cricoides. The cartilages which compoſe the Aſpera Arteria, or remaining part of the wind-pipe, are not quite annular, but connected by membranes at their back-part, to give way to the aliment deſcending through the Pharynx. Tab.i. 21.

THERE are other parts that authors call cartilages, which I rather chuſe to rank with the ligaments: And therefore will deſcribe them in that chapter, as thoſe between the bodies of the Vertebræ, &c.

I HAVE ſeveral times found ſupernumerary cartilages from the Sternum, running between the ribs, and frequently the Cartilago Enſiformis double. I do not remember that I have ever ſeen a cartilage ſcale like a bone, or ſlough like ſofter parts, though I have often ſeen them eat through by matter that has been collected in a joynt, which Tab.iv. E. has ſometimes occaſioned the bones to grow together.

CHAP. VII.

Of the Ligaments.

EVERY bone that is articulated to another for motion, is ty'd to that it moves upon, by a ligament, whoſe thickneſs and ſtrength always bears a proportion to the quantity of motion in the joynt, and the force with which it is liable to be moved; and the length of the ligament is no more than ſufficient to allow a proper quantity of motion.

THE bones of the limbs that move to all ſides, have ligaments like purſes, which ariſe from or near the edges of the ſockets of the receiving bones, and are inſerted all round the received bones, a little below their heads.

THE beginnings of theſe ligaments, from edges of theſe ſockets of the Scapula and Os Innominatum are very hard, almoſt cartilaginous, which ſerves in the Scapula to make a larger ſocket, and ſuch a one as will alter its figure as the bone moves, for the reaſon I have mentioned in the looſe cartilages of the knee; for the head of the Os Humeri, not being an exact portion of a ſphere, requires ſuch a ſocket, and the hard part of this ligament of the ſocket of the Os Innominatum makes the ſocket deeper than the ſemidiameter of the ſocket, without any hindrance to motion, becauſe it will give way to the neck of the Os Femoris, when it preſſes againſt it.

THE ligaments of thoſe articulations which admit only of flexion, and extenſion, differ from the former in this only; that they are much ſhorter and ſtronger at the ſides of the joynts, and thinner backward and forward.

AT the upper part of the articulation of the Os Femoris and Os Innominatum, is a ſtrong ligament of great conſequence; it contributing very much to preſerve that joynt from being luxated by the weight of the body. And from the lower edge of the Acetabulum of the Os Innominatum, runs a ligament to the middle of the head of the Os Femoris, about two inches long (which the Motion in this joynt requires) called Teres, or Rotundum, whoſe uſe is to prevent the Os Femoris from being luxated upwards, but downwards it will let it go far out of the ſocket; which fully ſhews, that in men it is particularly contrived to prevent the thigh-bone from being diſlocated upwards; but in brutes the head of the Os Femoris being oblong, and the cavity ſuitable, there can be only a rotatory motion, which in the effect will be very little more than that kind of motion which is called bending and extending; and this never removing the end of the head of the bone far in the ſocket, a ſhort ligament is enough for it, and will better keep the bone in its place; and therefore it is that theirs is ſo ſhort. This ligament in men may alſo ſerve to preſs the gland in the bottom of the Acetabulum or ſocket.

TOWARDS the great Foramen, of the Oſſa Innominata, the Acetabulum has a deep notch, from one ſide of which to the other, runs a ligament, which I have ſeen oſſified. Such a ligament there is alſo running from one proceſs of the Scapula to the other, which hinders the Os Humeri from diſlocating upward.

IN the middle and back part of the joynt of the knee are two very ſtrong ligaments which ariſe from a proceſs at the end of the Tibia. They croſs each other in ſuch a manner, as is beſt to ſecure the joynt from being diſplaced any way; they alſo hinder the extenſors of the Tibia from pulling that bone too far forwards.

ALL the bones of the Vertebræ, and every joynt that is without motion, and not joined by a ſuture, as the Oſſa Innominata with each other, and the Os Sacrum with the Oſſa Innominata, are all joined by intervening ligaments, commonly called cartilages.

The Proceſſus Dentatus of the ſecond Vertebra, is tied to the ſcull by a ligament, and kept cloſe to the fore-part of the firſt Vertebra by another in that Vertebra, that it may not bruiſe the ſpinal marrow; and when either this ligament or proceſs is broke, it makes that ſort of broken neck which is attended with ſudden death.

The bones of the Carpus and Tarſus are tyed together by ligaments running promiſcuouſly upon their ſurfaces from one to another, which at the under ſide of the Tarſus are vaſtly ſtrong, becauſe they ſupport the whole body. There is alſo to the Carpus, a ſtrong ligament which runs from the fifth bone to the eighth, and the proceſs of the fourth bone: The proper uſe of this is, to bind down the tendons of the muſcles that bend the fingers.

The Os Hyoides to the Proceſſus Styliformis of the Os Petroſum, the Patella to the Tibia, and the ſeſamoid bones in their places, are all tyed by ligaments.

From the edge of the Ilium to that of the Os Pubis, runs a ligament which is contiguous to, and appears to be a part of, the tendons of the oblique muſcles of the Abdomen; its uſe is to cover the iliack veſſels as they deſcend to the thigh: Under this ligament, together with the veſſels, I have often met with a rupture of matter, and, I think, ſometimes the gut, (however I dare affirm that to be a poſſible caſe) from the Abdomen into the anterior part of the thigh, immediately below the groin. Such caſes are well worth the obſervation of ſurgeons; becauſe opening ſuch tumours may be of very bad conſequence.

THE tendons of all the muſcles that are not involved in fat, are either tyed down to the bones they paſs over, by ligaments which contain a lubricating Mucus, or have ſometimes communications with the joynt they move: As has been curiouſly obſerved by Dr. Douglaſs, particularly in the joynt of the hip. The uſe of theſe ligaments is to confine them to their proper directions, and contain the Mucus that lubricates their ſurfaces, to make their motions more eaſy.

FROM the Tibia to the Fibula, and from the Ulna to the Radius, are tranſverſe ligaments which help to keep theſe bones together, and give origins to a great many muſcles. There is another of this ſort in the great Foramen of the Os Innominatum; and one between the Os Sacrum and proceſſes of the Oſſa Iſchia; and ſome more in the body, too ſmall to have a particular account given of them in this place.

AUTHORS agree that the ligaments are inſenſible; and give for their reaſon, that they would elſe be injured by ordinary motions. But they are much better contrived, ſeeing none of them, except thoſe which lie between the bones, are ſubject to attrition; and thoſe they have called cartilages. I do not think that theſe laſt are ſenſible; but the other I have had frequent experience are capable of very acute pains, there being not any thing our patients more grievouſly complain of, than collections of matter within theſe parts, or ſharp medicines applied to them when laid bare.

CHAP. VIII.

Of the lubricating Glands of the Joints.

EVERY joint where the bones are faced with a cartilage for a ſliding motion, is furniſhed with ſmall glands, which ſeparate a mucilaginous matter for the lubricating of the ends of the bones, that they may move eaſily upon one another; and that there may be no waſte of this neceſſary fluid, it is contained in the inveſting ligaments; which for this very reaſon are no where divided, except to communicate with the ligaments of tendons.

THESE glands are generally ſeated near the inſertions of the ligaments, that they may be compreſſed by them when the joints are in motion; which is a proper time to have their fluid preſſed out.

THERE is one large gland of this ſort, ſeated in a Sinus at the bottom of the Acetabulum of the Os Innominatum, which is compreſſed by the Ligamentum Teres.

WHEN from violent bruiſes, or any other cauſe, theſe glands are ulcerated, they throw off a corroſive matter, which erodes the cartilages of the bones, 'till it inſinuates it ſelf into their ſpongy heads, and renders their whole ſubſtance carious.

ous. When this diſeaſe happens to the hip, in time it makes its way through the ligament, and then it gets under the Gluteus Maximus to the outſide of the thigh under the flat tendon of the Faſcialis muſcle, and ſometimes to the forepart of the thigh, where the great blood-veſſels run. In this caſe, which is very rare, I apprehend that the ſurrounding ligament is perforated before, as was mentioned in the laſt chapter. Theſe caſes are generally, if not always, incurable.

A Caſe of a fractur'd ſcull, in a Girl nine years of age. Vide Tab. IX.

THIS girl being brought into the hoſpital the twenty ſeventh of May, ſeven days after the ſcull was fractured, having had all that time very bad ſymptoms; I immediately opened the ſcalp and let out about two ounces of grumous blood, and laid the ſcull bare about four inches one way, and three the other; and tied the blood veſſels, that I might make the operation without much difficulty, the next morning. The fracture extended acroſs the Os Bregmatis, from the ſagittal ſuture, to the temporal bone; that part next the Os Frontis was depreſſed equal to its thickneſs, and a great deal of extravaſated blood partly turned to matter, lay under the other part of the ſame bone. I made two perforations with the trephine, cloſe to the fracture, that I might raiſe it up ſteadily through both, and have more room for the extravaſated blood to diſcharge from under the ſcull; which had diſcharged before in great quantity through the fracture. But nevertheleſs ten days after the former operation, I was obliged to make another perforation, to diſcharge the matter more freely; for during a month, the matter ran through all her dreſſings down her face, twice every day, and was exceedingly fœtid; and for the ſpace of five months the matter decreaſed very little in quantity, but grew leſs and leſs offenſive, till September the thirteenth, when the leaſt of the bones was taken out; and on September the twenty ninth, the large one; after which time the matter was good, and not too much in quantity. Both theſe bones are through both Tables, for the motion in the brain was ſeen, only ſome little parts of the leſſer bone remaining, a callous was formed from them, but where the great one came away there was none, only a common cicatrix; and beſides theſe, there were many little bits of bone came away in the dreſſings: She was ſoon after cured, and has remained well ever ſince.

Tab. ix. C.

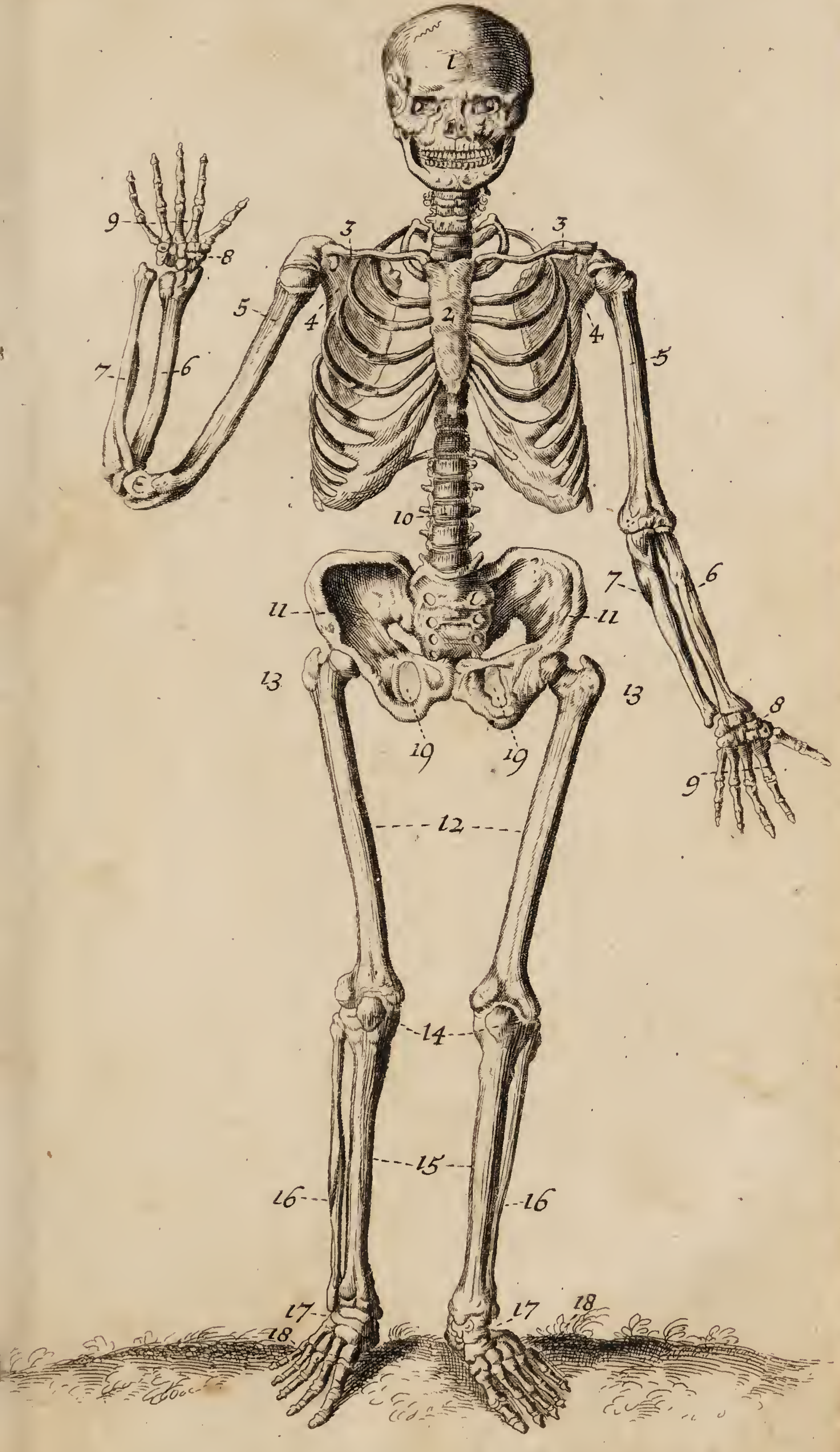
Tab. ix. D.

TABLE I.

The fore view of a ſceleton.

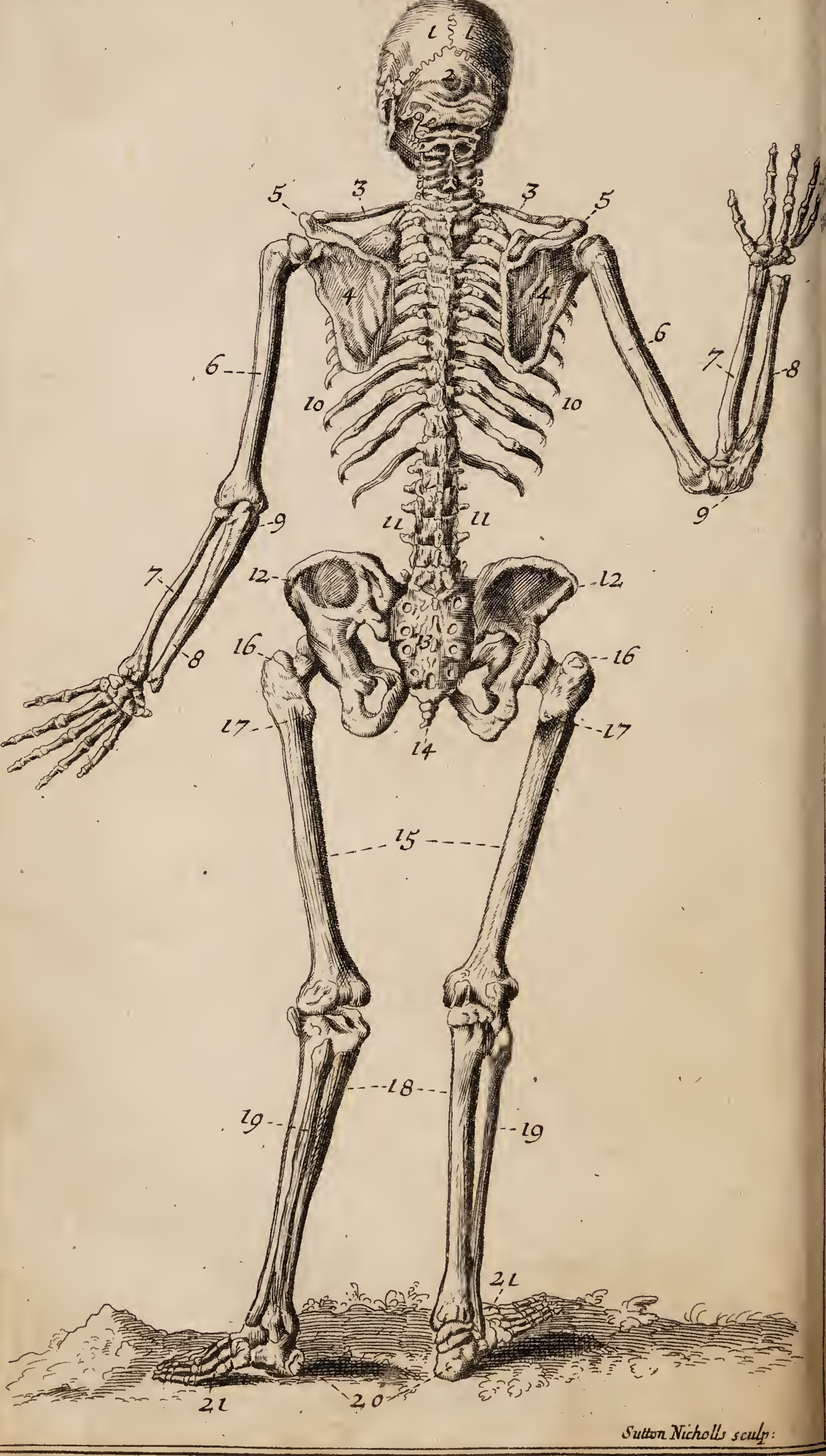
1 Os Frontis.
2 Oſſa Pectoris.
3 Clavicula.
4 Scapula.
5 Os Humeri.
6 Radius.
7 Ulna.
8 Carpus.
9 Metacarpus.
10 Spina Dorſi.
11 Os Innominatum.
12 Os Femoris.
13 Trochanter Major.
14 Patella.
15 Tibia.
16 Fibula.
17 Tarſus.
18 Metatarſus.
19 Foramen ovale —

p. 56. TAB. I.



Sutton Nicholls sculp.

p. 57. TAB. III



Sutton Nicholls sculp:

TABLE II.

The back view of a ſceleton.

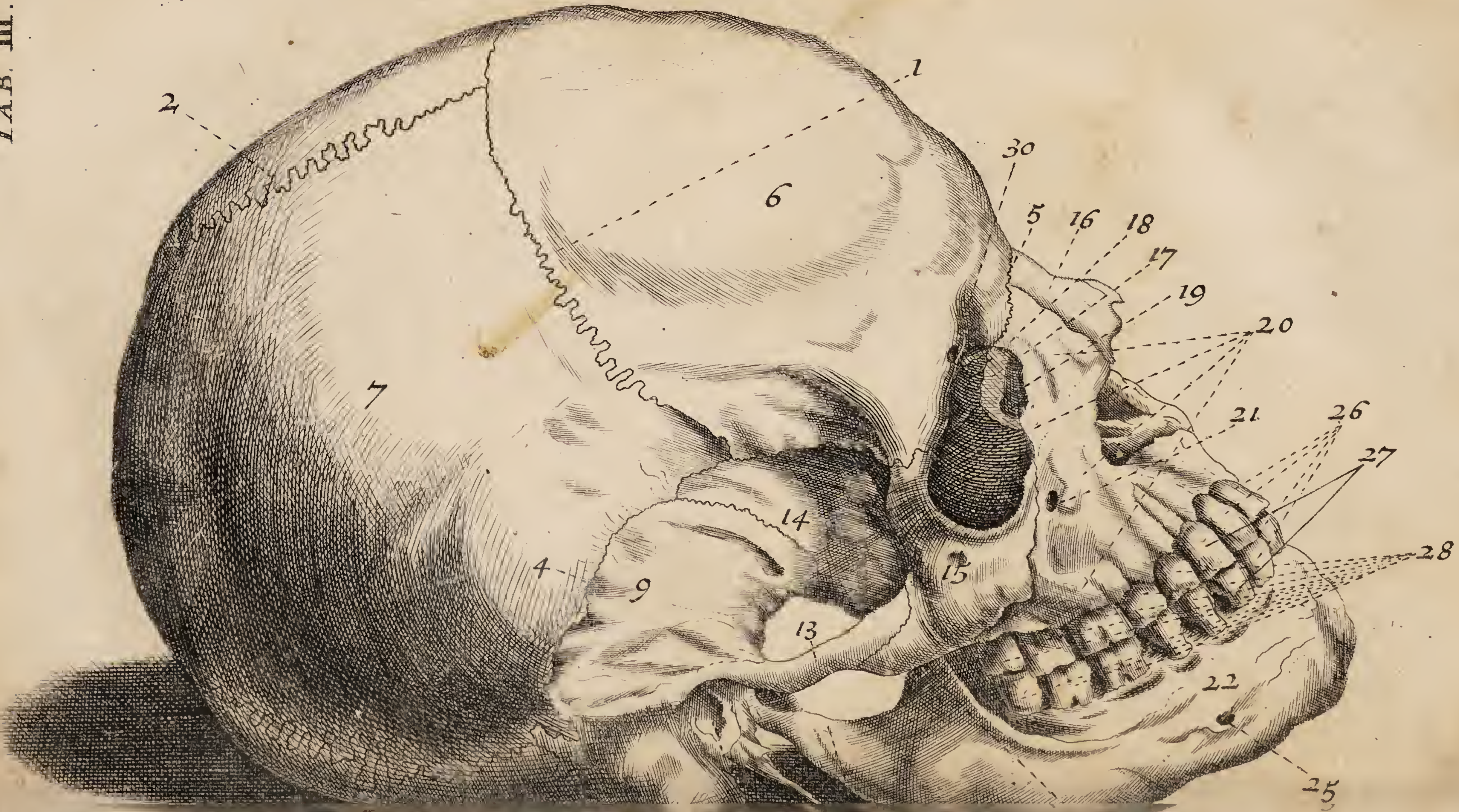
1 Os Bregmatis.
2 Os Occipitis.
3 Clavicula.
4 Scapula.
5 Proceſſus Acromion.
6 Os Humeri.
7 Radius.
8 Ulna.
9 Olecranon.
10 Coſtæ.
11 Spina.
12 Os Innominatum.
13 Os Sacrum.
14 Os Coccygis.
15 Os Femoris.
16 Trochanter Major.
17 Trochanter Minor.
18 Tibia.
19 Fibula.

TABLE III.

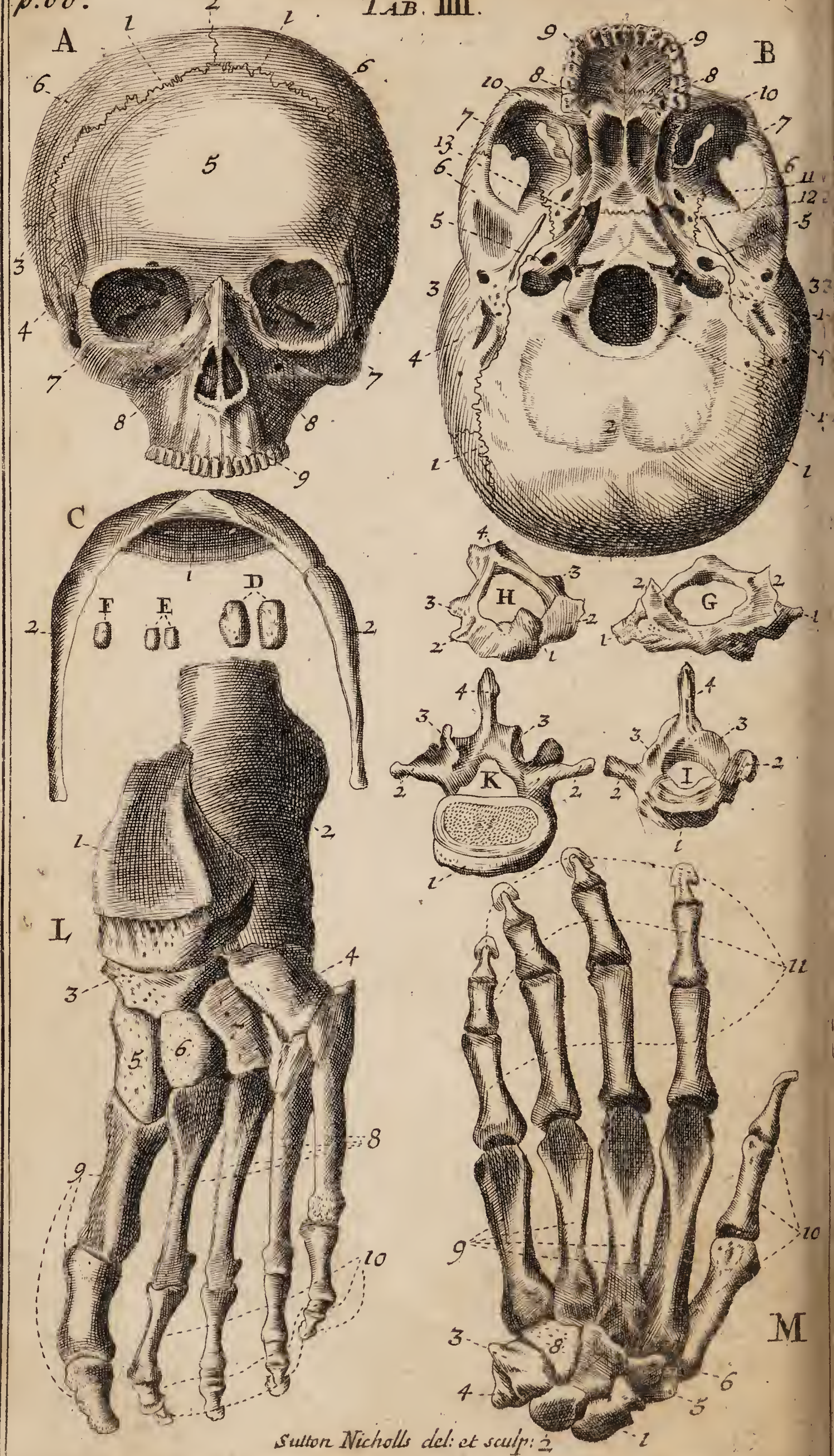
The bones of the head.

1 Sutura Coronalis.
2 Sutura Sagittalis.
3 Sutura Lambdoidalis.
4 Sutura Squamoſa.
5 Sutura Tranſverſalis.
6 Os Frontis.
7 Os Bregmatis.
8 Os Occipitis.
9 Os Temporis.
10 Proceſſus Mamillaris.
11 Meatus Auditorius.
12 Proceſſus Styliformis.
13 Proceſſus Jugalis.
14 Os Sphenoides.
15 Os Malæ.
16 Os Naſi.
17 Os Unguis.
18 Os Planum.
19 Ductus ad Naſum.
20 Maxilla ſuperior.
21 Foramen Maxillæ ſuperioris.
22 Maxilla inferior.
23 Proceſſus Coronalis.
24 Proceſſus Condyloides.
25 Foramen.
26 Dentes Inciſorii.
27 Dentes Canini.
28 Dentes Molares.

TAB. III.



TAB. IIII.



Sutton Nicholls del: et sculp: 2

TABLE IV.

A, *The fore view of the ſcull.*

1 Sutura Coronalis.
2 Sutura Sagittalis.
3 Sutura Squamoſa.
4 Sutura Sphenoidalis.
5 Os Frontis.
6 Os Bregmatis.
7 Os Malæ.
8 Os Naſi.
9 Maxilla ſuperior.

B, A View of the Baſis of the ſcull.
1 Sutura Lambdoidalis.
2 Os Occipitis.
3 Os Temporis.
4 Proceſſus Mamillaris.
5 Proceſſus Styloides.
6 Proceſſus Jugalis.
7 Os Malæ.
8 Os Palati.
9 Maxilla ſuperior.
10 Proceſſus Pterygoides.

C, The Os Hyoides.
1. Baſis.
2. Cornua.

D, The Oſſa Seſamoidea of the great toe.

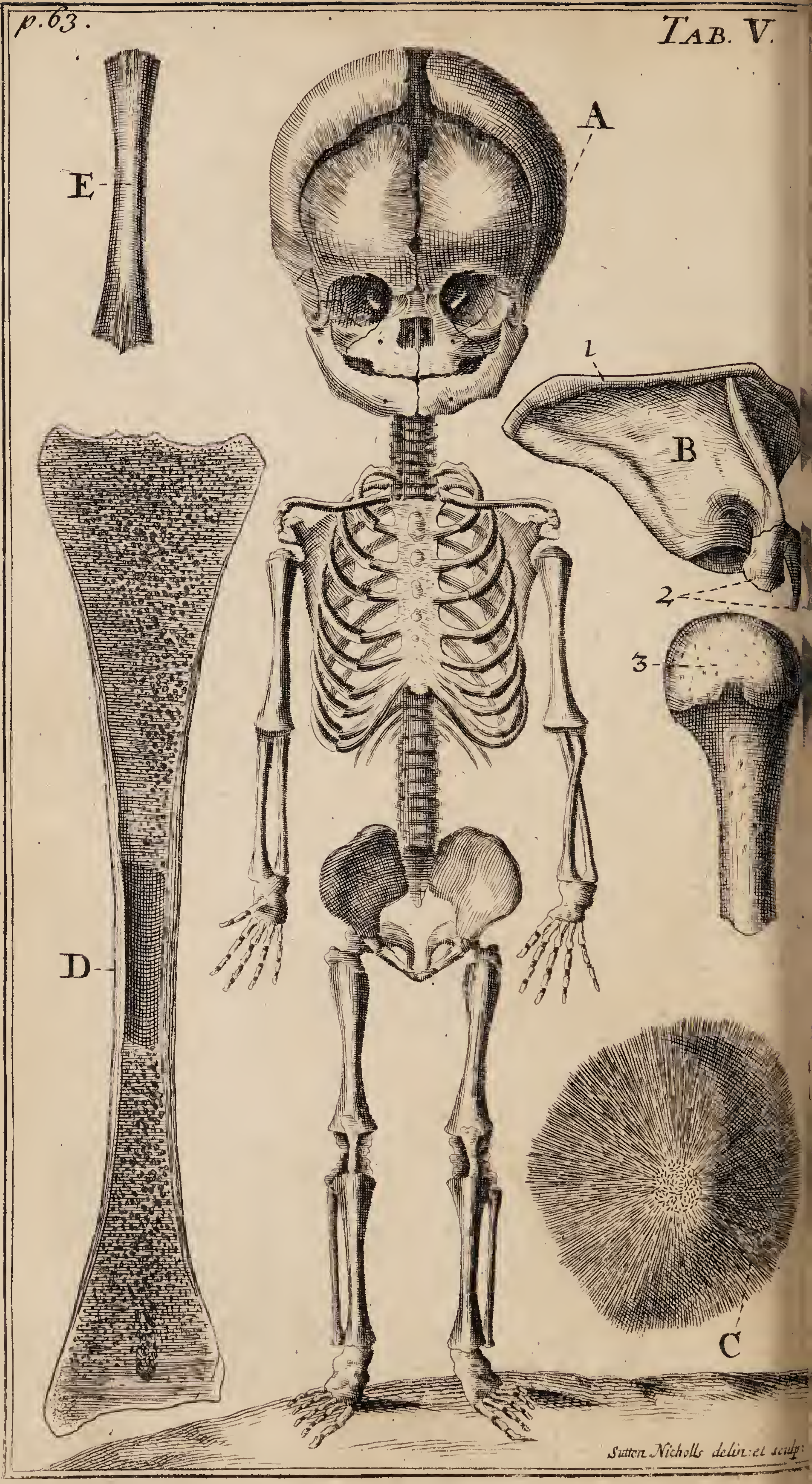
E, The Oſſa Seſamoidea of the thumb.

F, The ſeſamoid bone that is ſometimes found near the beginning of the Plantaris muſcle.

G, The firſt Vertebra.
1 Proceſſus Tranſverſus.

2 Proceſſus Obliquus.
H, The ſecond Vertebra.
1 Proceſſus Dentatus.
2 Proceſſus Tranſverſus.
3 Proceſſus Obliquus.
4 Proceſſus Spinalis.
I, One of the Vertebræ of the Thorax.
1 Corpus Spongioſum.
2 Proceſſus Tranſverſus.
3 Proceſſus Obliquus.
4 Proceſſus Spinalis.
K, One of the Vertebræ of the loins.
1 Corpus Spongioſum.
2. Proceſſus Tranſverſus.
3 Proceſſus Obliquus.
4 Proceſſus Spinalis.
L. The bones of the Foot.
1 Aſtragalus.
2 Os Calcis.
3 Os Naviculare.
4 Os Cuboides.
5 Os Cuneiforme majus.
6 Os Cuneiforme medium.
7. Os Cuneiforme minimum.
8 Metatarſus.
Oſſa Pollicis Pedis.
10 Oſſa Digitorum Pedis.
M, The bones of the hand.
1, 2, 3, 4, 5, 6, 7, 8. } The eight bones of the Carpus.
9 Metacarpus.
10 The bones of the thumb.
11 The bones of the fingers.

TABLE



Sutton Nicholls delin: et sculp:

TABLE V.

A, Shews the ſceleton of a full grown Fœtus, in which may be obſerved, the Epiphyſes, the Carpus and Tarſus, which are cartilaginous ſhrunk in drying, and the ſhape in general differing from the ſceleton of an adult.

B, The Scapula of a body twelve years old.

1 An Epiphyſis at the Baſis.

2 The Epiphyſes of its Proceſſes.

3 The Epiphyſis at the upper end of the Os Humeri from the ſame body.

C, The Bregma of a Fœtus five months old prepared, to ſhew the fibres oſſifying from a middle point, and ſhooting out on every ſide.

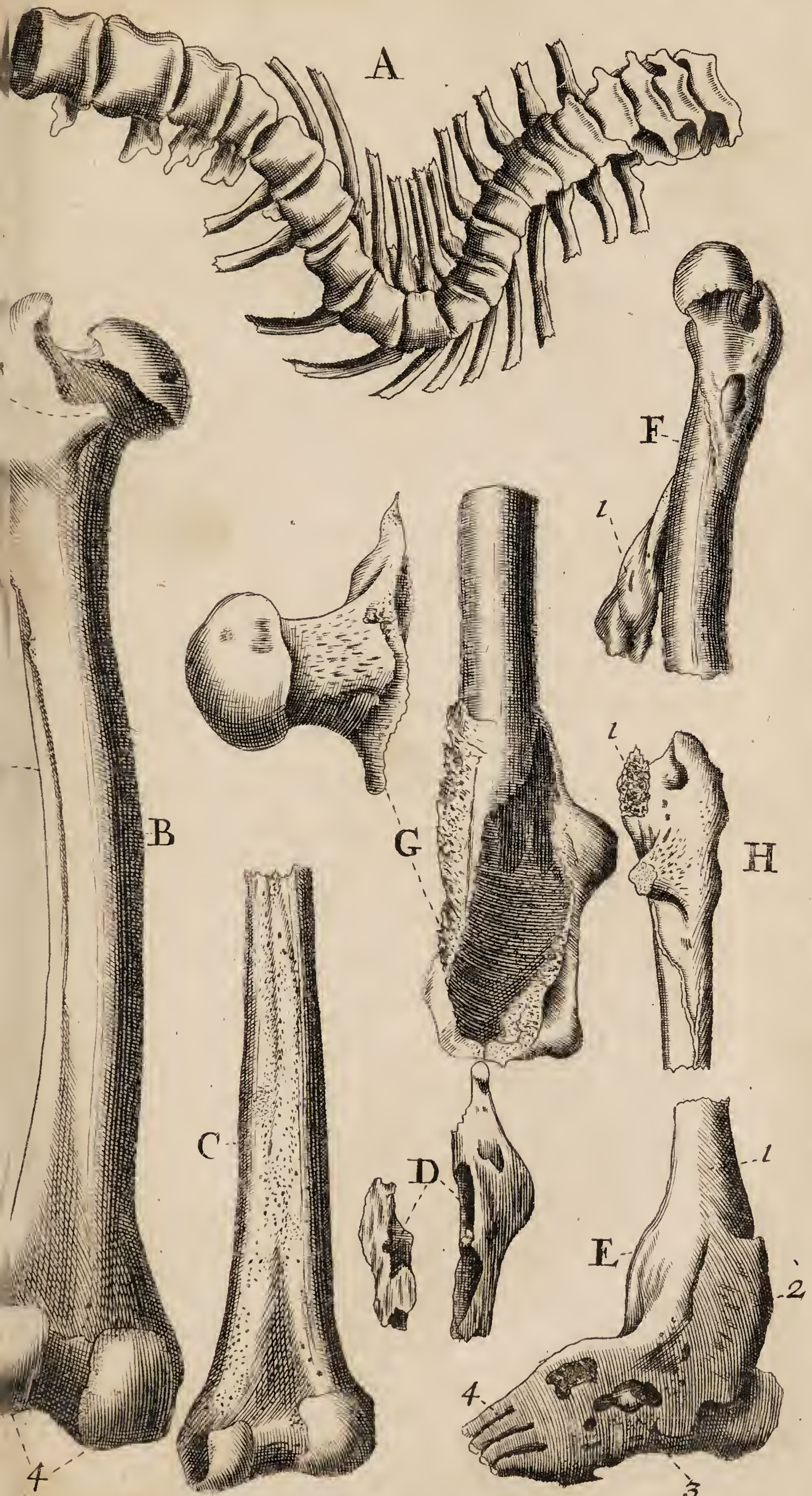
D, The Tibia ſawed length-ways.

E, The Tibia of a Fœtus five months old with the Epiphyſes off.

TABLE VI.

A, A diſtorted ſpine.
B, The Os Femoris of a man eight foot high.
  1 Shows three Trochanters.
  2 A fourth Trochanter.
  3 The Linea Aſpera.
  4 The two inferior Apophyſes.
C, Part of an Os Femoris carious.
D, Half the lower jaw exfoliated.
E, Part of a carious leg and foot, with all the bones grown into one.
  1 The Tibia.
  2 The Fibula.
F, Part of a thigh-bone.
  1 A bony excreſcence.
G, The head of the Os Femoris broken off, which had been miſtaken for a luxation.
H, Another piece of an Os Femoris with the head broke off; which was alſo miſtaken for a luxation.

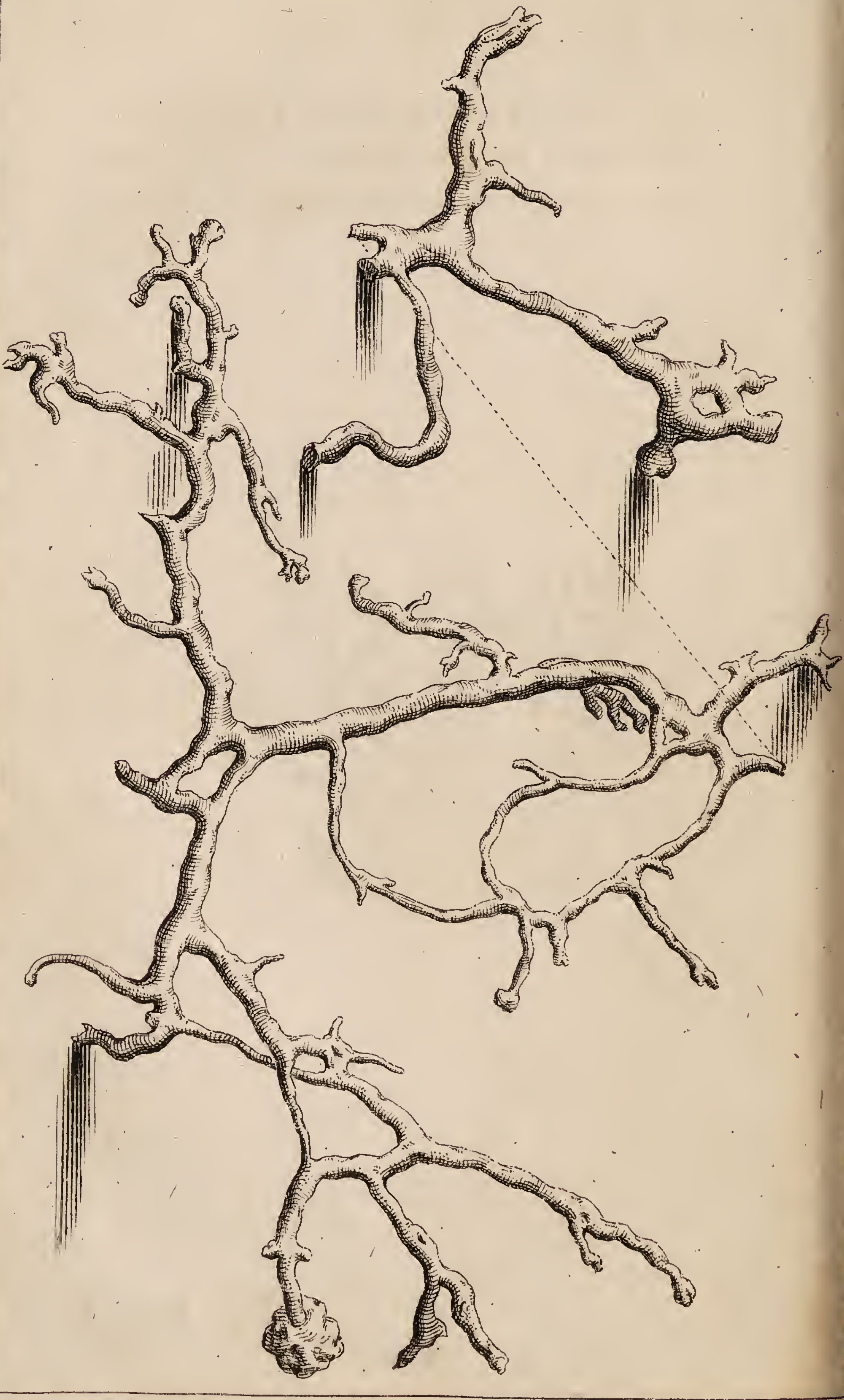
TAB. VI.



Sutton Nicholls delin: et sculp:

p. 65.

TAB. VII.



I.dr Gucht. Sculp

TABLE VII.

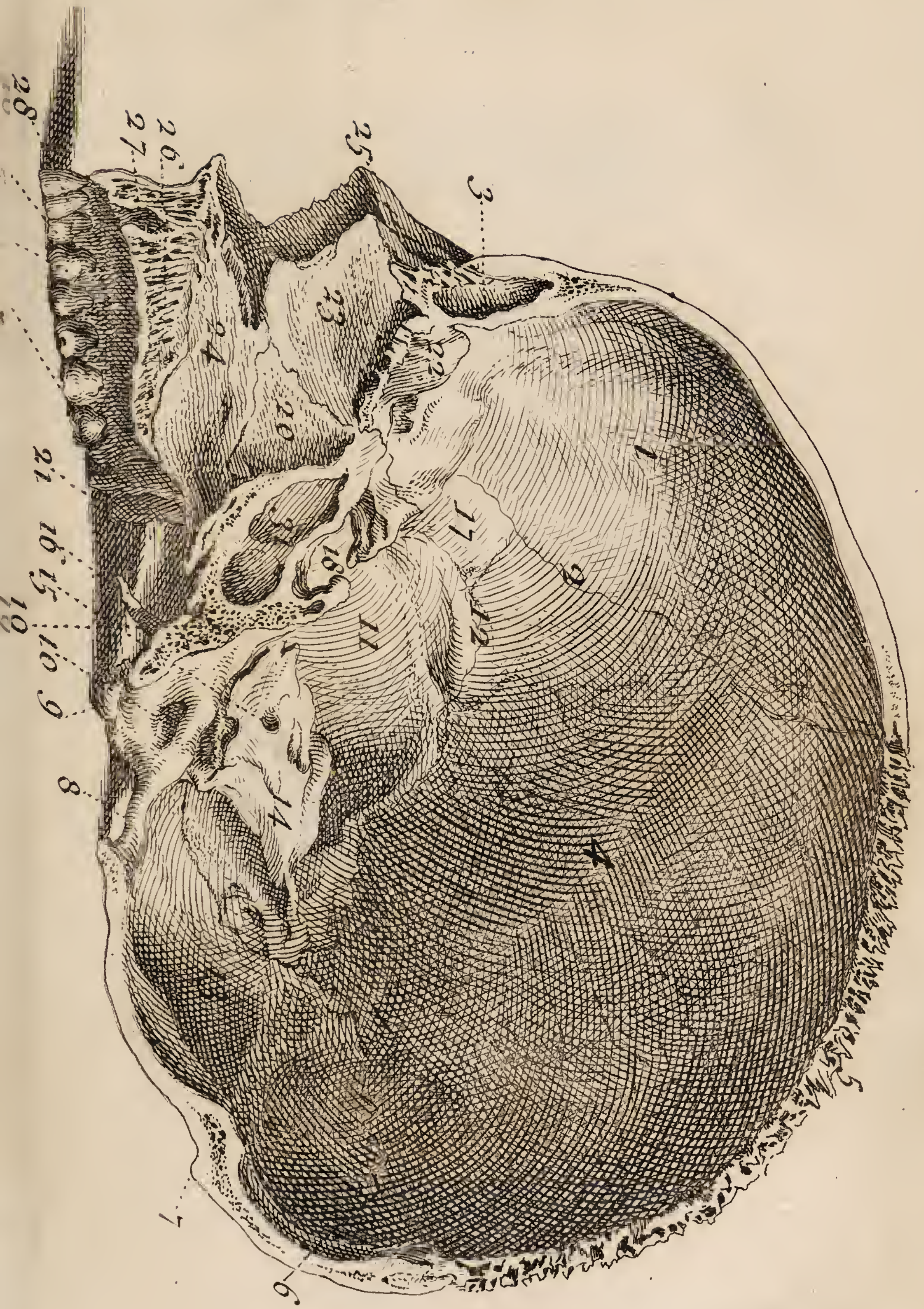
A Bone from the Omentum of a ſheep taken out and delineated by Dr. Steukly. The pricked Line ſhews the places where the bones were united.

TABLE VIII.

REPRESENTS the inſide of the ſcull ſaw'd through longitudinally.

1 Os Frontis.
2 Sutura Coronalis.
3 Sinus Frontalis.
4 Os Bregmatis.
5 Sutura Sagittalis.
6 One of the Oſſa Triquetra.
7 A proceſs of the Os Occipitis.
8 Part of the Foramen Maximum.
9 The proceſs of the occipital bone that articulates it to the ſpine.
10 The ninth Foramen of the ſcull.
11 Os Temporis.
12 Sutura ſquamoſa.
13 Os Occipitis.
14 Os Petroſum.
15 A Foramen, through which paſſes the auditory nerve.
16 Proceſſus Styliformis.
17 Os Sphenoides.
18 Sella Turcica.
19 The Suture between the Os Occipitale and Sphenoidale.
20 A proceſs of the Os Sphenoidale that makes part of the Septum Naſi.
21 Proceſſus Pterygoides.
22 Criſta Galli of the Os Ethmoides.

Tab. VIII.



3 A proceſs of the Os Ethmoides making part of the Septum Naſi.
4 Os Vomer.
5 Os Naſi.
6 The Suture that divides the Maxilla Superior.
7 A perforation in the Maxilla Superior.
8 Dentes Inciſorii.
9 Dens Caninus.
0 Dentes Molares.
1 Sinus Sphenoidalis.

TABLE IX.

A, A BONE taken out of the muſcular part of the heart of a man. Vide page 7.

B, A bone taken out of the firſt proceſs of the Dura Mater not far from the Criſta Galli.

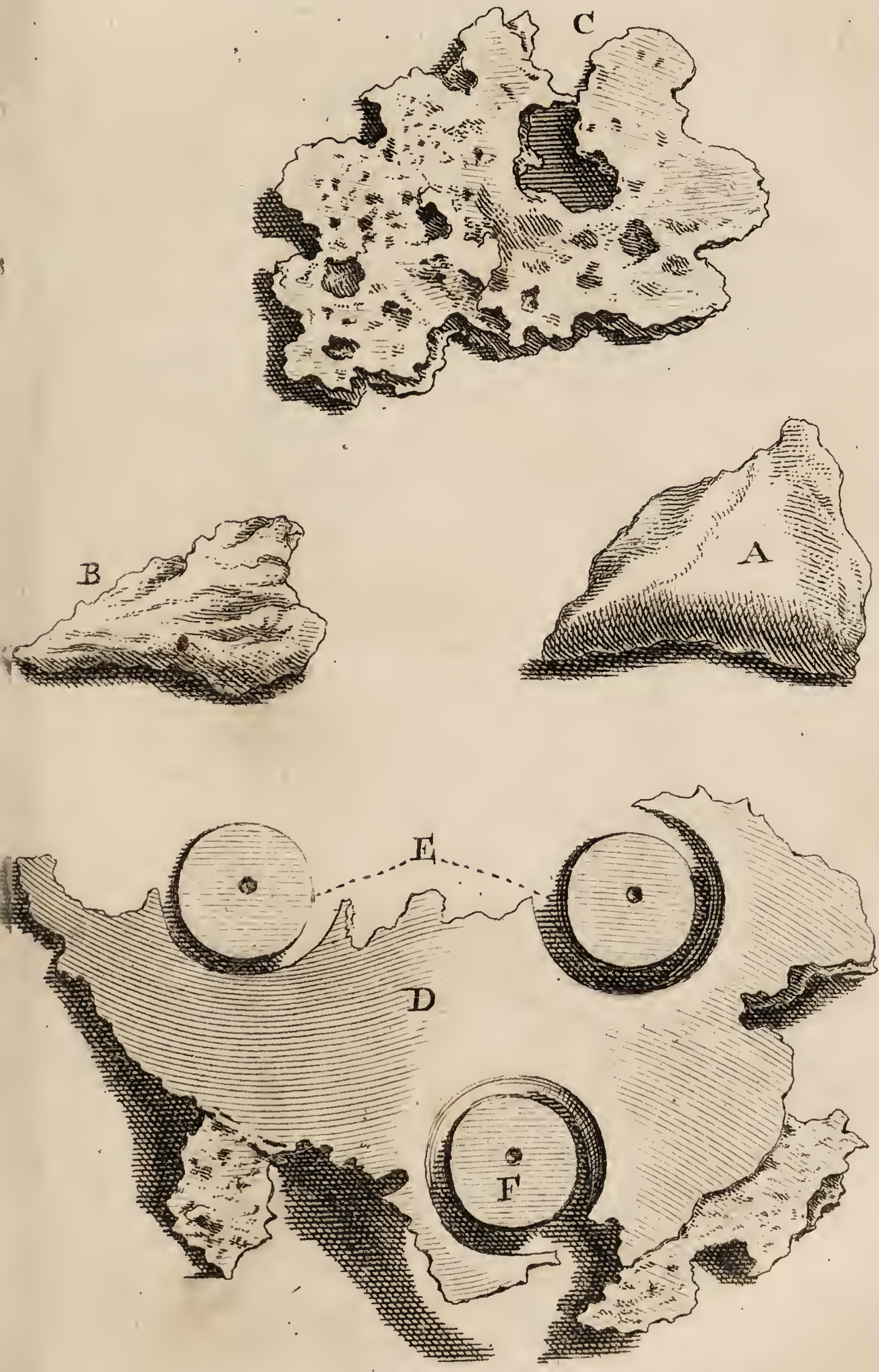
C, D, The two bones mentioned, page 54.

C, Shews the under ſide of that part of the Os Bregmatis that was depreſſed.

D, The piece of bone that ſeparated laſt, and which was not depreſſed.

E, The two places firſt trephined.

F, The place laſt trephined to give more vent to the matter.



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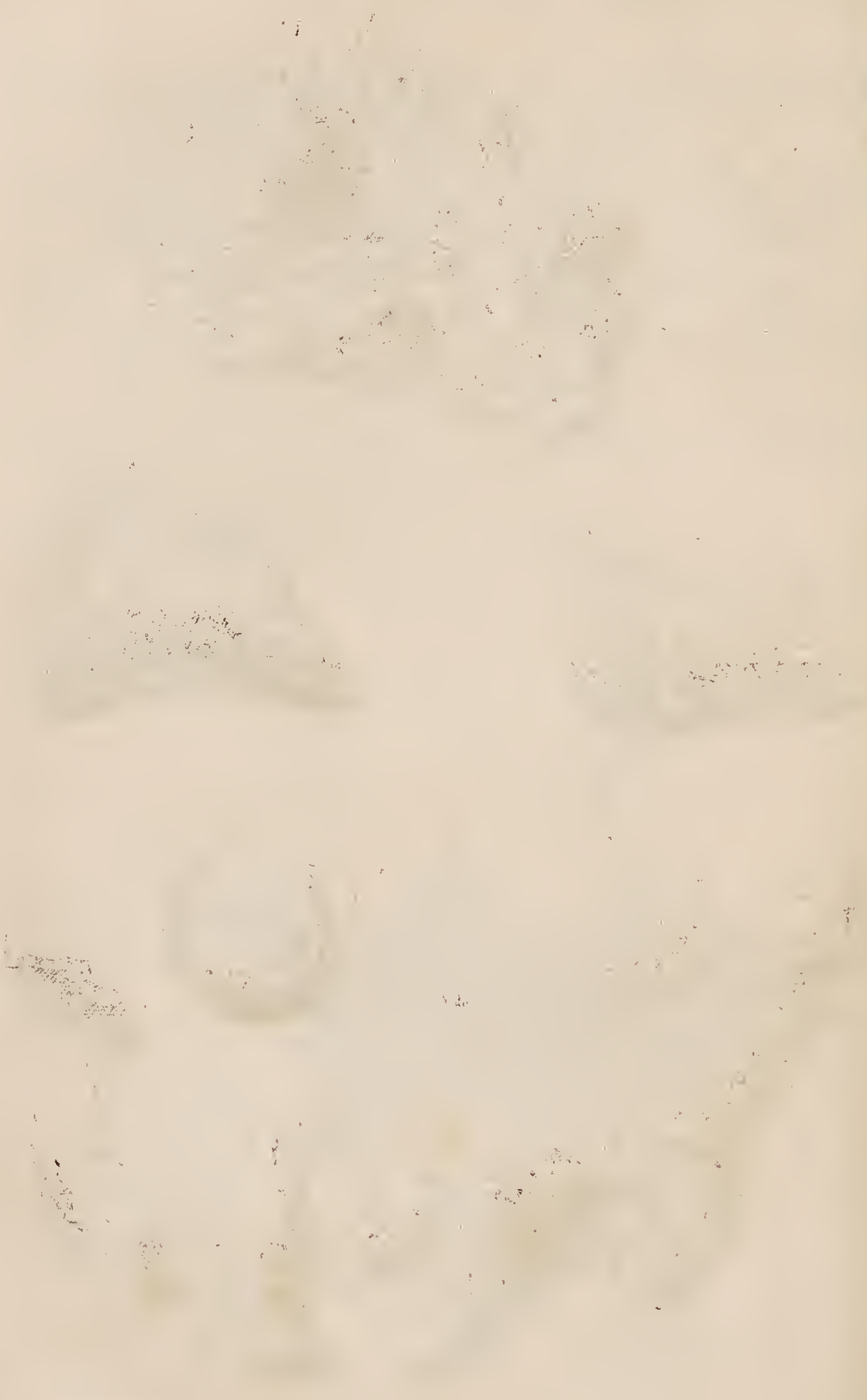


Pag.69 *Tab.*

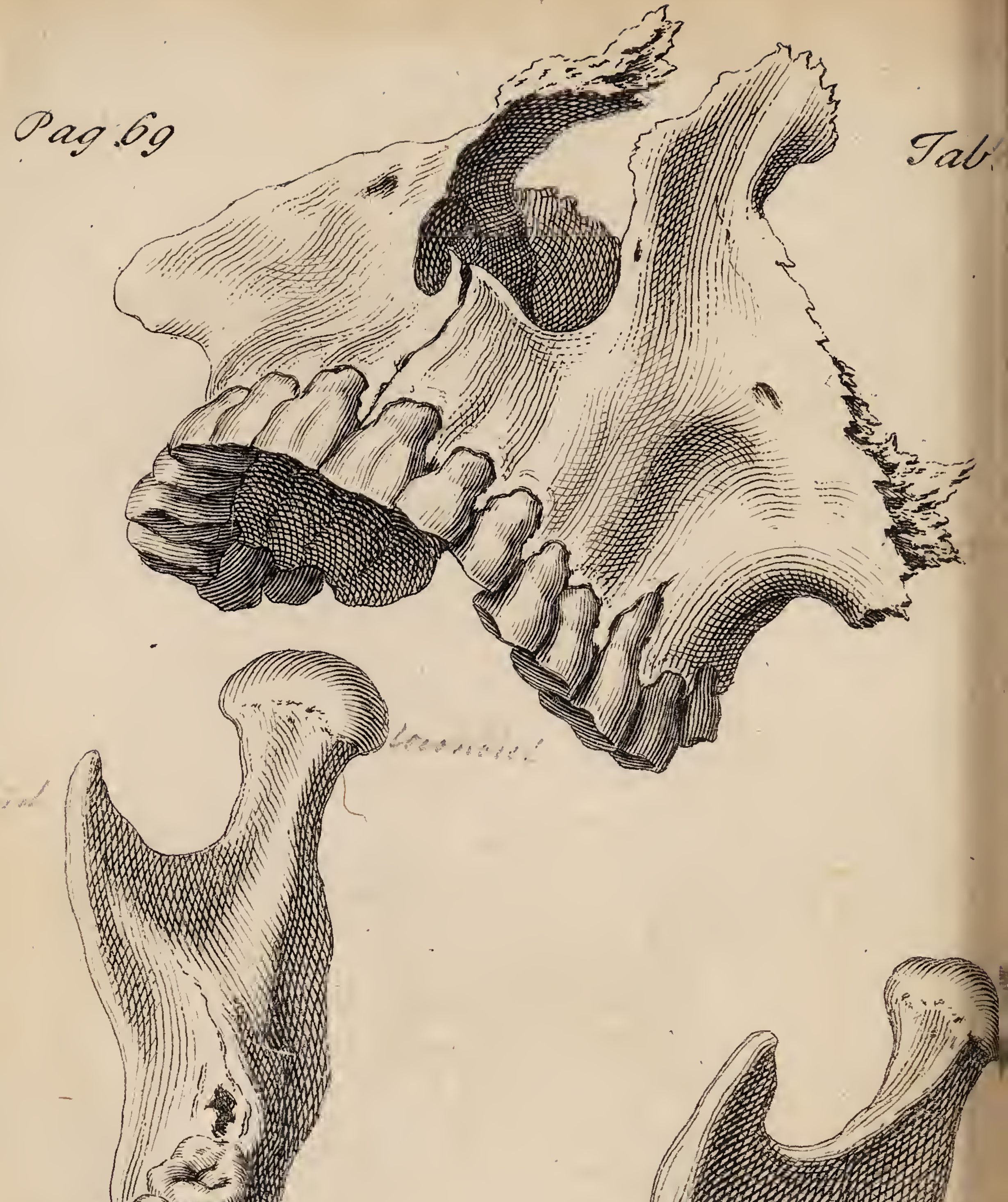


TABLE X.

The upper and lower jaw, being a ſpecimen of an Oſteology in folio, in which every bone will be done as large as the life.

BOOK II.

CHAP. I.

Introduction to the Muſcles.

THE muſcles are moving powers, applied to perform the ſeveral motions of the body; which they do by contracting their length, and thereby bringing the parts to which they are fixed nearer together. The immovable or leaſt moved part any muſcle is fixed to, is uſually called its origin, and the other its inſertion; but muſcles that have their two ends equally liable to be moved, may have either called their origins or inſertions.

EACH muſcle is made up of a number of ſmall fibres which Borelli and others have thought to be ſtrings of bladders, and have endeavoured to account for muſcular motion by an expanſion made from an influx of blood and animal ſpirits into theſe bladders; but as the muſcles do not increaſe their bulk ſenſibly in contracting, there needs no more to be ſaid to refute this hypotheſis. (See Dr. Pemberton's introduction to Cowper on the muſcles.) But Dr. Keil thought that in this way the muſcles might be contracted by a ſwelling, ſcarce ſenſible, if the bladders are but very ſmall: For, ſays he, ſuppoſing a bladder of any determined bigneſs can raiſe a weight a foot, a hundred bladders whoſe diameters are each a hundredth part of the former will raiſe the weight to the ſame height; but the force of inflation and the ſwelling of all together will be ten thouſand times leſs, and it will alſo raiſe ten thouſand times leſs weight, which he has not obſerved; therefore not one ſuch ſtring of bladders, but ten thouſand muſt be applied to do the ſame thing that the one bladder will do: and they will have the ſame ſwelling, otherwiſe it would be eaſy to ſhew how to make a Perpetuum Mobile of prodigious force. For the Diſcovery of this miſtake in Dr. Keil, I am obliged to Dr. Oldfield.

THE muſcles are of two ſorts, viz. rectilineal and penniform. The former have their fibres almoſt parallel in the ſame or near the ſame direction, with the Axis of the muſcle; and the latter have their fibres joined in an oblique direction, to a tendon paſſing in or near the Axis, or on their outſide.

THE rectilineal muſcles, if their origins and inſertions are in little compaſs, are never of any conſiderable thickneſs, unleſs they are very long, becauſe the outward fibres would compreſs the inner ones, and make them almoſt uſeleſs; and therefore every rectilineal Muſcle whoſe inner fibres

bres

bres are compreſſed by the outer, have their inner fibres longer than the external, that they may be capable of equal quantity of contraction.

THE Penniform muſcles, though they are in a manner free from the inconvenience of one fibre compreſſing another, and though by the obliquity of their fibres, nothing is abated of their moment, as is clearly demonſtrated by an Experiment of Mr. Hawkſbee's, where it is ſhewn, that in all caſes, juſt ſo much more weight as rectilineal fibres will raiſe than oblique ones, the oblique will move their weight with juſt ſo much greater velocity than the rectilineal; which is making their moments equal: So that in the ſtructure of an animal, like all mechanic engines, whatever is gained in ſtrength is loſt in velocity, and whatever is gained in velocity is loſt in ſtrength. Yet the fibres of the penniform muſcles becoming more and more oblique as they contract, their ſtrength decreaſes, and their velocity increaſes, which makes them leſs uniform in their actions than the rectilineal muſcles; wherefore it ſeems that nature never uſes a penniform muſcle where a rectilineal muſcle can be uſed; and the caſes in which a rectilineal muſcle cannot be uſed, are where the ſhape of a muſcle is ſuch as that the inward fibres would be too much compreſſed, or where rectilineal fibres could not have a lever to act with, ſuitable to their quantity of contraction, which is the caſe of all the long muſcles of the fingers and toes; for every muſcle muſt be inſerted or paſs over the centre of motion of the joynt it moves, at a diſtance proportionable to Tab. xii.

its quantity of contraction, and the quantity of motion in the joynt moved; for if it was inſerted too near, then the motion of the joynt would be performed before the muſcle is contracted all that it can; if too far off, the muſcle will have done contracting before the whole motion of the joynt is made; and tho' the quickneſs and quantity of motion in a muſcle will be, Cæteris Paribus, as the length of its fibres; for if a fibre four inches long will contract one inch in a given time, a fibre eight inches long will contract two inches in the ſame time; and the ſtrength of a muſcle or power to raiſe a weight, Cæteris Paribus, will be as the number of its fibres; for if one fibre will raiſe a grain weight, twenty fibres will raiſe twenty grains. Nevertheleſs, two muſcles of equal magnitude, one long, and the other ſhort, will both move the ſame weight with the ſame velocity when applied to a bone; becauſe the levers they act with muſt be as their lengths, and therefore the penniform and ſhort thick muſcles are never applied to a bone for the ſake of ſtrength, nor long fibred muſcles for quickneſs; for whatever is gained by the form of the muſcle, whether ſtrength or quickneſs, muſt be loſt by their inſertions into the bone, or elſe the muſcles muſt not act all they can, or the bones have leſs motion than they are fitted for.

In the limbs ſeveral muſcles paſs over two joynts, both of which they are liable to move at once, with force proportionable to the levers they act with upon each joynt; but either joynt being fixed by an antagoniſt muſcle, the whole force of ſuch muſcles will be exerted upon the other joynt; which in that caſe may be moved with a velocity equal to what is in both joynts, when theſe muſcles act upon both at once. This mechaniſm is of great uſe in the limbs, as I ſhall ſhew in the proper places.

THAT only we call the proper uſe and action of any muſcle which it has without the neceſſary aſſiſtance of any other muſcle, and what that is in a muſcle moving a joynt we may always know, and with what force it acts, Cæteris Paribus, by dropping a line from the center of motion of the joynt, it moves perpendicular into the Axis of the muſcle in any ſituation; but in a joynt which admits only of flexion and extenſion, this line muſt alſo be perpendicular to the Axis of motion in that joynt, and the action of the muſcles will be in the direction of that perpendicular line, and the force with which it acts in any ſituation will be, Cæteris Paribus, as the length of that perpendicular line.

EACH muſcle, ſo far as it is diſtinct and is moved againſt any part, is covered with a ſmooth membrane to make the friction eaſy; but where they are externally tendinous thoſe tendons are often ſmooth enough to make ſuch a covering needleſs. Beſides this membrane there is another, known by the name of Faſcia Tendinoſa, which deſerves to be particularly conſidered. The ſtrong one on the outſide of the thigh, which belongs to the Faſcialis and Gluteus muſcles is of great uſe in raiſing the Gluteus farther from the centre of motion of the joynt it moves, to increaſe its force: in like manner the Faſcia detached from the tendon of the Biceps Cubiti alters its direction for the ſame purpoſe, but thoſe on the outſide of the Tibia and Cubit, &c. are only flat tendons from which the fibres of the muſcles ariſe as from the bones. There are alſo in many places ſuch tendons between the muſcles, from which each muſcle ariſes in like manner; for the bones themſelves are not ſufficient to give origin to half the fibres of the muſcles that belong to them; beſides, if all the fibres had riſe from the bones they muſt have been liable to compreſs one another very inconveniently.

CHAP. II.

Of the Muſcles.

Muſcles of the Abdomen. Tab.xii.9.

OBLIQUUS DESCENDENS, ariſes fleſhy from near the extremities of the eight inferior ribs, the upper part of its Origin being indented with the Serratus Major Anticus, and the lower laying under a ſmall portion of the Latiſſimus Dorſi. It is inſerted fleſhly into the upper part of the ſpine of the Ilium, and by a broad flat tendon (which firmly adheres to a like tendon of the following muſcle as they paſs over the Rectus) into the Os Pubis, and Linea Alba, which is a ſtrong tendinous line extended from the Os Pubis to the Sternum, between the Muſculi Recti.

OBLIQUUS ASCENDENS, ariſes fleſhy under the former muſcle from the ſpine of the Ilium, and is inſerted fleſhy in the cartilages of the three loweſt ribs, and by a flat tendon into the Sternum, and Linea Alba, together with the tendon of the foregoing muſcle. The line in which theſe two tendons join on the outſide of the Rectus muſcle, is called Semilunaris: And though ſo much of this muſcle as is inſerted fleſhy runs obliquely upward, yet the middle and lower part is directed tranſverſe and downward; and beſide the tendon which it unites with the Obliquus Deſcendens, it often detaches another near the Sternum to be inſerted with the Tranſverſalis under the Rectus.

PYRAMIDALIS, ariſes from the Os Pubis, and is inſerted into the Linea Alba about three or four inches below the navel: This and its fellow are often wanting. Tab. xii. 11.

RECTUS, ariſes tendinous from the Os Pubis, but fleſhy when the Pyramidales are wanting, and is inſerted into the lower part of the Sternum near the Cartilago Enſiformis. This muſcle is divided into four or five portions by tranſverſe tendinous interſections, that it might conveniently bend when the body is bowed forwards, though this muſcle ſhould be then in action; and theſe interſections are chiefly above the navel, where it is moſt liable to be bent: Beſides being thus divided, its chief preſſure will not be in its middle, but under the ſeveral bellies of the muſcle, and the greateſt below the navel, where is the longeſt fleſhy belly of this muſcle, Tab. xii. 10.

and where the parts in the Abdomen ſeem to want moſt to be ſupported.

TRANSVERSALIS, ariſes by a flat tendon from the tranſverſe proceſſes of the lumbal Vertebræ, and fleſhy from the inſide of the ribs below the Diaphragm, and from the ſpine of the Ilium, then becoming a flat tendon, it paſſes under the Rectus to its inſertion into the Linea Alba. Between this tendon and the Peritoneum, ſometimes water is found in great quantities, which diſtemper is called the dropſy in the duplicature of the Peritoneum, which ſhews this membrane has been miſtook for part of the Peritoneum.

THESE five pair of muſcles all conſpire to compreſs the parts contained in the Abdomen. The Obliquus Deſcendens on the right ſide, and Aſcendens on the left acting together, turn the upper part of the trunk of the body towards the left, & Vice Verſa; but the trunk is chiefly turned upon the thighs; the Recti bend the body forward, and pull the Sternum downward in expiration; the two oblique muſcles and the tranſverſe on each ſide near the groins, are perforated to let through the Proceſſus Vaginalis with the ſpermatick veſſels. Theſe perforations are diſtant from each other, ſo as to ſuffer the veſſels to deſcend conveniently into the Scrotum; this way the inteſtines or the Omentum, deſcend in ruptures.

Muſcles of the Teſtes.

CREMASTER TESTIS, is a ſmall portion of fibres which ariſes from the Ilium, and appears to be part of the Obliquus Aſcendens muſcle, till it meets with the ſpermatick veſſels at their coming out of the Abdomen, where it begins to deſcend with them by the ſide of the Proceſſus Vaginalis, to the teſticle, over which it is looſely expanded. This muſcle is too ſmall to be plainly diſcovered in emaciated bodies.

Muſcles of the Penis.

ERECTOR PENIS, ariſes from the Os Iſchium, and is inſerted into the Crus Penis near the Os Pubis. It is ſaid, by preſſing the Penis againſt the Os Pubis, to compreſs the Vena Ipſius Penis, and hinder the reflux of blood, whereby the Penis becomes extended and erect; but it does not appear to me to be well contrived for that uſe.

ACCELERATOR URINÆ: This, with its fellow, are but one muſcle; it ariſes tendinous from the Oſſa Iſchia, and fleſhy from the Sphincter Ani, or, according to Mr. Cowper, from the ſuperior part of the Urethra as it paſſes under the Os Pubis; and thence being expanded over the bulb of the Urethra, it afterwards divides, and is inſerted into the Penis. The uſe of this muſcle is not to accelerate the urine, for that is propell'd by the Detruſor Urinæ, or muſcular coat of the bladder, but to protrude the Semen, which is done only by this; and it being ſeated oppoſite to the Os Pubis, it ſeems to be much better fitted to be a relaxer of the Penis by pulling it from the Os Pubis, than the Erector is for the office aſſigned it.

TRANSVERSALIS PENIS, is that part of the former muſcle which ariſes from the Oſſa Iſchia.

Muſcles of the bladder.

SPHINCTER VESICÆ URINARIÆ, is a ſmall portion of muſcular fibres, not eaſily to be diſtinguiſhed, running round the neck of the bladder to prevent the involuntary effuſion of urine.

DETRUSOR URINÆ, is the muſcular coat of the bladder; its fibres are differently diſpoſed; but chiefly terminating in the Sphincter Veſicæ, whereby it not only preſſes the urine forward, but when the bladder is full, becomes an antagoniſt to the Sphincter, acting almoſt at right angles.

Muſcles of Clitoris. ERECTOR CLITORIDIS, ariſes from the Iſchium, and is inſerted into the Crus Clitoridis, like the Erector Penis in men, and is ſaid, to cauſe erection in the ſame manner.

Muſcles of the Vagina. SPHINCTER VAGINÆ, is an order of muſcular fibres intermixed with membranous fibres ſurrounding the Vagina Uteri near its orifice; it is connected to the Oſſa Pubis and Sphincter Ani; its uſe is to conſtringe the orifice of the Vagina, to preſs out a liquor from the glands of the Vagina, and embrace the Penis in coition.

Dr. DOUGLAS mentions two pair of muſcles of the Vagina of his own diſcovering, which I have never diſſected, and will therefore give them in his own words: The firſt ariſes from the inner edge of the Os Pubis mid-way between the Iſchion and the beginning of the Crus Clitoridis, is inſerted into the Vagina; the ſecond ariſes tendinous and fleſhy from the Os Pubis internally in common with the Levator Ani, is inſerted into the upper part of the Vagina at the ſide of the Meatus Urinarius or Collum Veſicæ.

Muſcles of the Anus.

Sphincter Ani, is a muſcle near two inches in breadth, ſurrounding the Anus to cloſe it, and to prevent involuntary falling out of the Fæces.

Levator Ani, by Dr. Douglaſs, called two pair of muſcles, but Mr. Cowper deſcribes the whole as one muſcle only, which ariſes from the Oſſa Iſchii, Pubis, and Sacrum within the Pelvis, and is inſerted round the lower end of the Rectum Inteſtinum.

Fistula's in Ano, that are within this muſcle, generally run in the direction of the gut, and may be laid open into the gut with great ſafety; but thoſe fiſtula's, or rather abceſſes that are frequently formed on the outſide of the Sphincter, and uſually ſurround it, all but where this muſcle is connected to the Penis, cannot be opened far into the gut, without totally dividing the Sphincter, which, Authors ſay, renders the Sphincter ever after uncapable of retaining the excrement. One inſtance of this kind I have known; but Mr. Berbeck, of York, an excellent ſurgeon, and particularly famous for this operation, has aſſured me, that he has often been forced to divide the Sphincter, which has made the patients unable to hold their excrements during their cure, but the wounds being healed, they have retained them as well as ever.

Muſcles of the Os Coccygis.

Goccygei ariſe from the acute proceſſes of the Oſſa Iſchii, and are inſerted into the Os Coccygis, which they pull forward.

Muſcles of the Scalp. Tab. x. A.

Occipito-Frontalis, is a muſcle with four fleſhy bellies, commonly named Frontales and Occipitales. It ariſes behind each ear from the Os Occipitis, and ſoon becoming tendinous, paſſes under the hairy ſcalp to the forehead, where it becomes broad and fleſhy, adhering to the ſkin, and is inſerted into the upper part of the orbicular muſcles of the eye-lids into the Os Frontis near the noſe, and by two proceſſes into the bones of the noſe. When this muſcle acts from the back-part, it pulls the ſkin of the forehead upward, and wrinkles it tranſverſe, and in ſome perſons the hairy ſcalp backwards; but when the fore-part of it acts, it draws the ſkin with the eye-brows downward, and towards the noſe when we frown. The tendon of this muſcle has been miſtaken for a membrane, and been called Pericranium, and the true Pericranium, Perioſteum.

Muſcles of the external ear.

ELEVATOR AURICULÆ, ariſes from the tendon of the Occipito-Frontalis, and is inſerted into the upper part of the ear that is connected to the head.

RETRACTOR AURICULÆ, ariſes by one, two or three ſmall portions from the temporal bone above the mamillary proceſs, and is inſerted into the ear to pull it backward.

Muſcles of the eye-lids. Tab. x. D.

ORBICULARIS PALPEBRARUM, ſurrounds the eye-lids on the edge of the orbit, and is fixed to the Sutura Tranſverſalis at the great corner of the eye; it ſhuts the eye-lids, eſpecially in winking. That part of this muſcle that lies under the eye-brow is very much intermixed with the Occipito-Frontalis, and under it from the Os Frontis near the noſe, ariſes a ſmall portion of diſtinct fibres which end in this muſcle, and, I think, are a part of it; nevertheleſs, from the effect of their action, are not improperly called Muſculus Corrugator.

Ciliaris, is a very ſmall portion of this muſcle, next the ciliary cartilages of the eye-lids.

Elevator Palpebræ Superioris Rectus, ariſes above the optick nerve, from the Perioſteum at the bottom of the orbit (as do alſo the five following muſcles) and is inſerted into the whole ciliary cartilage of the upper eye-lid by a very thin flat tendon.

Muſcles of the eyes. Tab.x. Q.

Elevator Oculi, ariſes from the bottom of the orbit, between the optick nerve and the foregoing muſcle, and is inſerted into the upper part of the Tunica Sclerotis of the eye, near the Cornea.

Tab. x. R. Depressor Oculi, ariſes, and is inſerted directly oppoſite to the laſt deſcribed muſcle.

Tab. x. S. Adductor Oculi, ariſes from the bottom of the orbit, near the optick nerve internally, and is inſerted into the Tunica Sclerotis on the ſide next the noſe.

Tab. x. T. Abductor Oculi, has both its origin and inſertion, directly oppoſite to the Adductor.

Tab. x. N. Obliquus Superior, ſeu Trochlearis, ariſes between the Elevator and Adductor Oculi at the bottom of the orbit, thence aſcending by the Sutura Tranſverſalis, becomes a round tendon, which paſſing through a pulley at the upper and inner part of the orbit near its edge, is inſerted near the bottom of the globe of the eye, which

Tab. x. O.

which it pulls upward and inward, and thereby directs the pupil outward and downward.

Tab. x. P. OBLIQUUS INFERIOR, ariſes from the Os Maxillæ Superioris, at the edge of the orbit; thence paſſing over the Depreſſor is inſerted near the Abductor at the bottom of the eye, but not ſo low as the inſertion of the Obliquus Superior: It turns the pupil upward and outward.

THESE muſcles are inſerted with great Advantage to move a ſmall weight, and are very long, that the eye may be moved with ſufficient quickneſs. The two oblique muſcles are an Axis to the motions of the other four, and acting ſtrongly againſt them, (which action I take to be what is vulgarly called ſtraining the eye) may, I think, bring the cryſtalline humour nearer to the Retina, and even make the cryſtalline humour more flat to fit the eye for objects at a great diſtance; for this end it ſeems to me that there are ſix muſcles thus diſpoſed, when three would be ſufficient to turn the eye every way, if it was in a fixed ſocket; and it ſeems alſo that while the muſcles are all thus in action, the ſuperior oblique in each eye ſets the pupil farther from the noſe, while the inferior oblique directs it upward; the firſt of which actions is always neceſſary, and the latter often ſo, when we look with both eyes at very diſtant objects; and when the two oblique muſcles grow weak by age or diſeaſe, or ceaſe to act at all, as in paralytick caſes, and death, then the eye ſinks in the orbit.

Muſcles of the Lips. Tab. x. E.

SPHINCTER or CONSTRICTOR ORIS, ſurrounds the mouth about three fourths of an inch broad. This muſcle is very much intermixed with all the muſcles that are inſerted into it.

ELEVATOR LABII SUPERIORIS PROPRIUS, ariſes from the bone of the upper jaw under the anterior and inferior part of the Orbicularis Palpebrarum, and uſually takes another ſmall beginning from the Os Malæ, which ſeems as if it was ſent off from the Orbicularis Palpebrarum; and paſſing down by the ſide of the noſe, into which it ſends ſome fibres, is inſerted into the upper part of the Sphincter Oris. This raiſes the upper lip, and helps to dilate the noſtrils. Tab. x. F.

DEPRESSOR LABII SUPERIORIS PROPRIUS, is a ſmall muſcle ariſing from the upper jaw near the Dentes Inciſorii, and is inſerted into the upper part of the lip and root of the cartilages of the noſe; hence it is alſo a depreſſor of the noſe, which action conſtricts the noſtrils.

DEPRESSOR LABII INFERIORIS PROPRIUS, ariſes broad from the lower jaw at the chin, and is ſoon inſerted into the Sphincter Oris; the order of fibres in this ſeems not ſo conſpicuous as in the other muſcles of the face. Tab. xiii. l.

ELEVATOR LABII INFERIORIS PROPRIUS, ariſes from the lower jaw, near the Dentes Inciſorii, and is inſerted into the lower part of the lip.

ELEVATOR LABIORUM COMMUNIS ariſes from a depreſſed part of the Superior Maxilla under the middle of the orbit, and is inſerted into the Sphincter muſcle near the corner of the mouth. Tab. xiii. G.

Tab. xiii. H. DEPRESSOR COMMUNIS LABIORUM, ariſes laterally from the lower jaw near the chin, and is inſerted into the Sphincter, oppoſite to the former.

Tab. xiii. K. ZYGOMATICUS, ariſes from the anterior part of the Os Zygoma or Malæ, and frequently derives a portion of fibres from the Orbicularis Palpebrarum, thence running obliquely downwards; it is inſerted into the Sphincter at the corner of the mouth betwixt the Elevator Communis and Buccinator; it draws the corner of the mouth outward and upward. When this muſcle grows weak, the corner of the mouth ſinks, as may be obſerved in old perſons.

Tab. xiii. L. BUCCINATOR, ariſes from the Proceſſus Coronæ of the lower jaw, and paſſing contiguous to both jaws, is inſerted into the Sphincter muſcle at the corner of the mouth. It ſerves either to force breath out of the mouth, or thruſt the aliment between the teeth in maſtication, or to pull the corner of the mouth outward.

PLATYSMA MYOIDES, ariſes looſely from over the pectoral and part of the deltoid muſcle, and running obliquely forward, is inſerted into the chin, and depreſſor muſcles of the lips. This muſcle being exceeding thin (a mere Membrana Carnoſa) ſerves to cover the unequal ſurface of the ſubjacent muſcles, and render the neck even; it alſo pulls down the corner of the mouth, and from its inſertion at the chin, may contribute to the pulling down of the lower jaw.

Muſcles of the noſe. RETRACTOR ALÆ NASI, is a very ſmall muſcle ariſing from the bone of the noſe, and is inſerted into the ſkin and cartilage at the ſide of the noſe.

Muſcles of the Os Hyoides.

MYLOHYOIDEUS, with its fellow, may be eſteemed one penniform or elſe a digaſtrick muſcle: It ariſes from the Linea Aſpera on the inſide of the lower jaw and Proceſſus Innominatus, both ſides meeting at about right angles in a middle line upon the following muſcles. It is inſerted by a ſmall portion of fibres into the Baſis of the Os Hyoides; it moves the tongue upward and forward, and alſo compreſſes the following muſcles, whereby they raiſe the tongue more commodiouſly, and alſo hinders them from drawing the Baſis of the Os Hyoides into a right line betwixt the chin and Sternum at ſuch times as the Stylohyoidei cannot act.

Tab. xii. 3.

GENIOHYOIDEUS, ariſes from the Proceſſus Innominatus of the lower jaw, under the foregoing muſcle, and is inſerted into the Baſis of the Os Hyoides, which it pulls upward and forward. This with its fellow, are for the moſt part but one muſcle.

STYLOHYOIDEUS, ariſes from the Proceſſus Styliformis near its root, and paſſing contiguous to the horn of the Os Hyoides becomes inſerted laterally into its Baſis. This muſcle is ſometimes perforated about the middle by the tendon of the digaſtrick muſcle of the lower jaw. Its uſe is to pull the Os Hyoides up and backward.

CORACOHYOIDEUS, ariſes from the upper Coſta of the Scapula near the Proceſſus Coracoides, and paſſing under the Maſtoideus muſcle becomes in that place a round tendon; thence paſſing almoſt parallel to the following muſcle, is inſerted together with it into the Baſis of the Os Hyoides; this draws the Os Hyoides downward, and a little backward. I have once ſeen one of theſe muſcles wanting, and the Sternohyoideus ariſing from the middle of the clavicle on that ſide.

Tab. xii. STERNOHYOIDEUS, ariſes from a roughneſs at the under part of the Clavicula near the Sternum, and the cartilaginous part of the firſt rib; and is inſerted into the Baſis of the Os Hyoides, to pull it downward.

Muſcles of the tongue. GENIOGLOSSUS, ariſes from the Proceſſus Innominatus of the lower jaw, and is inſerted broad into the under part of the tongue, to pull it up and forward, and ſometimes has a ſmall inſertion into the Os Hyoides.

BASIOGLOSSUS ſeems a portion of the former muſcle; it ariſes from the Baſis of the Os Hyoides, and is inſerted into the tongue nearer its tip.

CERATOGLOSSUS, ariſes from the horn of the Os Hyoides, and is inſerted laterally into the tongue near its root, to pull it downward and forward.

STYLOGLOSSUS, ariſes from the extremity of the Proceſſus Styliformis, and is inſerted into the tongue near the former to pull it up and backward. I have very often found another ſtyloid muſcle ſo inſerted, that I cannot tell whether to to call it a muſcle of the tongue or Pharynx.

THE Tongue is a muſcle made of fibres, longitudinal, circular, and tranſverſe, ſo intermixt as beſt to ſerve its ſeveral motions.

Muſcles of the Cartilago Thyroides.

HYOTHYROIDEUS or CERATOTHYROIDEUS, ariſes from part of the Baſis, and the horn of the Os Hyoides, and is inſerted into the lower part of the Cartilago Thyroides, to pull it upward.

STERNOTHYROIDEUS, ariſes from the inſide of the Sternum, and is inſerted with the former; it pulls the thyroid cartilage directly downward.

CRICOTHYROIDEUS, ariſes from the anterior part of the Cartilago Cricoides, and running obliquely upward and outward, is ſoon inſerted into the inſide of the Cartilago Thyroides, which it pulls towards the Cartilago Cricoides. Both this muſcle and its fellow, for the moſt part appear double.

Muſcles of the Cartilago Arytænoides.

CRICOARYTÆNOIDEUS POSTICUS, ariſes from the back-part of the Cartilago Cricoides, and is inſerted into the Arytænoides to pull it backward.

CRICOARYTÆNOIDEUS LATERALIS, ariſes laterally from the Cartilago Cricoides, and is inſerted laterally into the Arytænoides. This with its fellow, pull down each cartilage toward their origin, and thereby dilate the Rimula.

THYROARYTÆNOIDEUS, ariſes from the ſuperior, middle, and inner part of the Cartilago Thyroides, and is inſerted with the former into the Arytænoides cartilage to dilate the Rimula. Theſe two laſt deſcribed muſcles are not naturally divided, and therefore ought to be accounted but one muſcle.

ARYTÆNOIDEUS, is one ſingle muſcle ariſing from one arytænoidal cartilage, and is inſerted into the other to draw them together, and cloſe the Rimula. Theſe few ſmall muſcles of the tongue and Larynx, with only one pipe, make a greater variety of notes and ſounds than can be made by artificial inſtruments, and that in a manner ſo little underſtood by us, and by organs ſo little differing from thoſe in quadrupeds, that for ought we know of them, brutes might be as capable of all theſe ſounds as men.

Muſcles of the Pharynx.

STYLOPHARYNGEUS, ariſes from near the bottom of the Proceſſus Styloides of the Os Petroſum, and running obliquely downward, is inſerted into the Pharynx. This muſcle with its fellow, pulls up and dilates the Pharynx to receive the aliment.

ŒSOPHAGEUS, ariſes like a wing from ſeveral parts of the ſcull, tongue, Os Hyoides, the cricoid and thyroid cartilages, and is inſerted into the Pharynx. This with its fellow conſtringe the Pharynx, and preſs the aliment down the gullet.

MUSCULUS VAGINALIS GULÆ, is the muſcular coat of the Gula.

PTERYGOPHARYNGEUS, is not a diſtinct muſcle, but the beginning of the Pharynx near the Proceſſus Pterygoides, of the ſphenoidal bone.

Muſcles of the Palate.

PTERYGOSTAPHYLINUS INTERNUS, ariſes from the Os Sphenoides, near the Iter ad Palatum, or Euſtachian tube, and is inſerted into the Uvula, which it pulls up while we breath through the mouth or ſwallow.

PTERYGOSTAPHYLINUS EXTERNUS, ariſes by the ſide of the laſt deſcribed muſcle, and is alſo inſerted near it; but becomes its antagoniſt by being reflected on a pulley, over a proceſs at the lower part of the pterygoidal proceſſes of the ſphenoidal bone.

GLOSSO-STAPHYLINUS, is a very ſmall portion of muſcular fibres, which paſs from the tongue to the palate, which it pulls down when we breathe through the noſe.

THE palate it ſelf is a ſort of double muſcle, whoſe action ſeems only to ſupport it ſelf and aſſiſt thoſe muſcles which pull it upwards.

Muſcles of the lower jaw.

DIGASTRICUS, ariſes from the Sinus of the mamillary proceſs of the Os Temporis, and from a fleſhy belly, becoming a round tendon, paſſes through, and ſometimes under the Stylohyoideus muſcle; and then being tied down by a ligament to the Os Hyoides, grows fleſhy, and is ſo inſerted into the anterior part of the lower jaw internally. This muſcle's direction being altered by its being tied to the Os Hyoides, where it makes an angle, (and not at its paſſage through the Stylohyoideus) pulls the lower jaw downward with much greater force than otherwiſe it could have done: and being connected to the Os Hyoides, when it acts it prevents the action of ſeveral muſcles which are concerned in ſwallowing; whence it is that we cannot ſwallow at the ſame time, that we open the jaw, as thoſe brutes can whoſe digaſtric muſcles are not connected to that bone.

Tab. xiii. B.

TEMPORALIS, ariſes from the Os Frontis, Parietale, Sphenoides, Malæ and Temporis, and paſſing under the two proceſſes named Os Jugale, is inſerted externally into the Proceſſus Coronæ of the lower jaw, which it pulls upward. This muſcle is covered with a ſtrong tendinous Faſcia.

Tab. xiii. C. MASSETER, ariſes from the lower edge of the Os Malæ or Zygoma, and the proceſs which joins this from the temporal bone, and is inſerted to the outer part of the angle of the lower jaw, which it pulls up and forward. Theſe two laſt deſcribed muſcles having different Directions, when they act together, make a ſteady motion in the diagonal of their directions.

PTERYGOIDEUS INTERNUS, ariſes from the Proceſſus Pterygoideus Externus, and from the Sinus between the pterygoid proceſſes, and is inſerted internally into the angle of the lower jaw, which it pulls upward.

PTERYGOIDEUS EXTERNUS, ariſes from the Os Maxillare, and Os Sphenoides, near the root of the external pterygoid proceſs, and is inſerted internally into the Proceſſus Condyloides of the lower jaw, which it pulls to one ſide, and forwards, or acting with its fellow, pulls the jaw directly forwards.

Muſcle of the Clavicula. SUBCLAVIUS, ariſes from the ſuperior part of the firſt rib, and is inſerted into more than half the underſide of the clavicle next the Scapula. Its uſe is to draw the Clavicula toward the Sternum, that they may not be ſevered in the motions of the Scapula.

Muſcles of the Scapula. Tab. xiii. 2. TRAPEZIUS, ariſes from the Os Occipitis, and from a Linea Alba Colli, from the ſpinal proceſs of the laſt Vertebra of the neck, and the ten uppermoſt of the back, and from a Linea Alba between all theſe Proceſſes, and is inſerted into one third of the clavicle next the Scapula, almoſt all the back part of the ſpine of the Scapula, and as much of the Proceſſus Acromion as lies between the ſpine of the Scapula and the clavicle. This muſcle draws the Scapula directly backward.

It is generally ſaid by authors, that the ſeveral parts of this muſcle act at different times, and ſo pull the Scapula different ways, as obliquely upward, downward or backward; but, I think, if that happened, it muſt neceſſarily divide this muſcle into diſtinct portions, thoſe that contract always ſeparating from thoſe that do not.

Rhomboides, ariſes tendinous under the former from the ſpinal proceſs of the Inferior Vertebra of the neck, part of the Linea Alba Colli, and from the ſpinal proceſſes of the four or five uppermoſt Vertebræ of the Thorax, and is inſerted into the Baſis of the Scapula, which it pulls up and backward. The upper part of this muſcle ariſing from the neck, is in many bodies, by the motions of the neck, ſeparated and made a diſtinct muſcle. **Tab. xiii. 4.**

Elevator Scapulæ, ariſes from the tranſverſe Proceſſes of the four ſuperior Vertebræ of the neck, and is inſerted into the upper angle of the Scapula.

Serratus Minor Anticus, ariſes under the Pectoralis, from the third, fourth and fifth ribs, and is inſerted into the Proceſſus Coracoides Scapulæ; which it pulls forward and downward,

ward. This muſcle is always ſaid to be an Elevator of the ribs, though it ariſes from the Scapula, which is ſupported by the ribs.

SERRATUS MAJOR ANTICUS, ariſes from the anterior part of the eight ſuperior ribs, and is inſerted into the Baſis of the Scapula, which it draws forward, and by that means moves the ſocket of the Scapula upward. This muſcle has been always accounted an Elevator Coſtarum, though each portion of it is nearly parallel to the rib it riſes from.

ALL the muſcles inſerted into the Baſis of the Scapula, are alſo inſerted into one another.

Muſcles of the Humerus Tab. xii. 7.

PECTORALIS, ariſes from near two thirds of the Clavicula, next the Sternum, and all the length of the Os Pectoris, and from the cartilages of the ribs, and is inſerted into the Os Humeri, between the Biceps and the inſertion of the Deltoides. The uſe of it is to draw the arm forward. A ſmall portion of the lower part of this muſcle is often confounded with the Obliquus Deſcendens Abdominis; and in ſome bodies, neither the upper part, nor its tendon, can be eaſily ſeparated from the Deltoides; and in others, even that part of it that ariſes from the Clavicula, is a diſtinct portion. Near the inſertion of this muſcle, the fibres croſs thoſe from below, ending above in the arm, and thoſe from above below, that the tendon of this muſcle might not lie inconveniently low between the arm and Thorax, as it would have done, had the fibres which ariſe loweſt from the Sternum been inſerted loweſt in the arm: but this croſſing does not make the tendon at all ſtronger, as is often ſaid; nor can I ſee how it came to be thought that this tendon ſhould want more ſtrength in proportion, than other tendons.

Deltoides, ariſes exactly oppoſite to the inſertion of the Trapezius, from one third part of the Clavicula, from the Acromion and ſpine of the Scapula, and is inſerted tendinous near the middle of the Os Humeri, which bone it lifts directly upward. The outermoſt parts of this muſcle, when the arm hangs down, lie below the center of motion of the joint, and therefore can have no ſhare in lifting the Humerus up till it is raiſed part of the way by the other part of this muſcle, and the following muſcle; and as the outer parts of this muſcle begin to act, the following muſcle acts with leſs advantage: And it ſeems to me, that the ſole reaſon why this muſcle is made of ſo many parts, is, that they may act independently; for it is demonſtrable, that this muſcle, when the whole of it acts, cannot raiſe the arm with ſo great advantage as a right-lined muſcle of the ſame magnitude would have done. Tab. xii. 6.

Supraspinatus, ariſes from the Dorſum Scapulæ above the ſpine, and paſſing between the two proceſſes, is inſerted into the upper part of the Os Humeri, which it helps to raiſe, until it becomes parallel with the Spina Scapulæ.

The Supraſpinatus, the Deltoides and Coracobrachialis, aſſiſt in all the motions of the Humerus, except depreſſion; it being neceſſary that the arm ſhould be raiſed and ſuſtained, in order to move it to any ſide.

Tab. xiii. 8. INFRASPINATUS, ariſes from the Dorſum Scapulæ below the ſpine, and is inſerted (wrapping over part of it) at the ſide of the Head of the Os Humeri; it turns the arm ſupine and backward; for there is a prone and ſupine rotatory motion of the Humerus of near 90 Degrees.

TERES MINOR, is a ſmall muſcle ariſing below the former from the Inferior Coſta Scapulæ, and is inſerted together with it. It aſſiſts the former in turning the arm ſupine, but pulls it more downwards.

Tab xiii. 7. TERES MAJOR, ariſes from the lower angle of the Scapula, and is inſerted at the under part of the Os Humeri about three fingers breadth from the head. This draws the Os Humeri toward the lower angle of the Scapula, and turns the arm prone and backward.

Tab. xiii. 6. LATISSIMUS DORSI, ariſes by a flat tendon from the ſpinal proceſſes of the ſeven or eight inferior Vertebræ of the back, and thoſe of the loins, Sacrum and Ilium; and growing fleſhy after it has paſſed the extenſors of the trunk, receives another ſmall fleſhy beginning from the ninth, tenth and eleventh ribs, and is inſerted into the Os Humeri, with the former. This turns the arm backward and prone. The tendon of this muſcle ſerves for a membrane to the extenſors of the back, and is connected to the tranſverſe proceſſes of the Vertebræ Lumborum.

SUBSCAPULARIS, ariſes from the hollow ſide of the Scapula, which it fills up, and is inſerted into the head of the Os Humeri, wrapping ſomewhat over it. This pulls the arm to the ſide, and prone.

Coracobrachialis, ariſes from the Proceſſus Coracoides Scapulæ, in common with the inſertion of the Serratus Minor Anticus, and is inſerted into the Os Humeri internally about its middle. This raiſes the arm, and turns it ſomewhat outward.

Muſcles of the Cubit. Tab. xii. 12.

Biceps Cubiti Flexor, ariſes with two heads, (that the fibres of this muſcle might not compreſs one another;) one from the Proceſſus Coracoides Scapulæ, in common with the Coracobrachialis muſcle, and the other by a round tendon from the edge of the Acetabulum Scapulæ, which paſſing in a Sulcus of the Os Humeri, afterward becomes fleſhy, and joins the firſt head to be inſerted with it into the tubercle of the Radius; and ſometimes this muſcle has a third head, which ariſes from the middle of the Os Humeri. This muſcle lifts up the Humerus, bends the cubit, and has as great a ſhare as any one muſcle in turning the cubit ſupine; the Humerus being fixed by other muſcles, the whole force of this muſcle will be exerted upon the cubit, or the cubit being fixed by an Extenſor, the whole force of it will be ſpent in raiſing the arm, and therefore ought to be always reckoned among thoſe that raiſe a weight at arms length. A puncture of the tendinous expanſion of this muſcle is ſuppoſed to be always attended with grievous pain and inflammation, and has, if we have not miſtaken the cauſe, ſometimes proved mortal; yet the beſt of ſurgeons, and particularly Mr. Cowper, has given us inſtances of larger tendons being cut and ſtitched, without any bad ſymptoms; and I have often ſeen them ulcerated and mortified, without any more ſign of pain than in other Parts: So that I cannot ſee what the great Miſchief of pricking this tendinous Faſcia is owing to, unleſs its lying ſo much upon the ſtretch, which may be wholly avoided by bending the elbow, and turning the cubit prone. Since I have conſidered this caſe, I have met with only one, which was thus injured by an injudicious blood-letter, who ordered the patient to keep her arm extended for fear of a contraction, and ſhe was not without the moſt violent pain for a whole fortnight; but upon bending the cubit, and turning the arm prone, ſhe grew preſently eaſy, and, in a few days, well. Nevertheleſs, I am perſuaded that moſt of the accidents which are thought to be merely from blood-letting are critical diſcharges of ſome Diſeaſe, and from the puncture a ſmall inflammation beginning, encreaſes and ſuppurates: But however ſingular I may be thought in this opinion, I can be ſure I am diſintereſted in it, having never had any ill accident follow blood-letting in my life.

Tab. xii. 13. BRACHEUS INTERNUS, ariſes from below the middle of the Os Humeri, and is inſerted into a rough place of the Ulna immediately below the juncture. This alſo bends the cubit.

SUPINATOR RADII LONGUS, ariſes from the lower and outer part of the Os Humeri, and is inſerted into the upper ſide of the Radius, near the Carpus. This muſcle is not a Supinator, but a bender of the cubit, and that with a longer lever than either of the two former muſcles, and is leſs concerned in turning the cubit ſupine, than either the extenſors of the Carpus, fingers or thumb.

TRICEPS EXTENSOR CUBITI, commonly diſtinguiſhed into Biceps and Bracheus Externus. The firſt of theſe heads ariſes from the lower Coſta of the Scapula near the Acetabulum; the ſecond from the outer and back-part of the Os Humeri; the third, lower and more internal; and are inſerted into the Proceſſus Olecranon of the Ulna. The firſt of theſe heads draws the arm backward, with as long a lever as it extends the cubit. Tab. viii. 9.

ANCONEUS, ariſes from the outward extuberance of the Os Humeri, and is inſerted into the upper part of the Ulna: This is alſo an Extenſor. Tab. xiii. 10.

Muſcles of the Palm of the hand.

PALMARIS LONGUS, ariſes ſmall from the inner extuberance of the Os Humeri, and from a ſhort belly ſoon becomes a tendon, which is connected to the Ligamentum Tranſverſale Carpi, and expanded in the palm of the hand. This muſcle is often wanting, but the expanſion in the hand never; yet it being connected to the ligament of the Carpus, it muſt bend the Carpus, and cannot conſtrict the palm of the hand; and when it is wanting the Flexor Carpi Radialis is larger.

PALMARIS BREVIS OR CARO QUADRATA, ariſes obſcurely from the Ligamentum Tranſverſale Carpi, and ſeems to be inſerted into the eighth bone of the Carpus and the metacarpal bone of the little finger. This helps to conſtrict the palm of the hand, and is very different in ſize in different bodies.

Muſcles of the Carpus.

Flexor Carpi Radialis, ariſes from the inner extuberance of the Os Humeri, and ſoon becoming a ſtrong tendon, paſſes through a chanel of the fifth bone of the Carpus, and is inſerted into the metacarpal bone of the fore-finger; this not only bends the Carpus upon the Radius, but alſo the bones of the ſecond order upon thoſe of the firſt; which motion is nearly as much as that upon the Radius.

Flexor Carpi Ulnaris, ariſes from the ſame extuberance with the former, and a Faſcia betwixt this muſcle and the Tenſor Ulnaris, contiguous to the Ulna, and is inſerted by a ſhort tendon into the fourth bone of the Carpus.

Tab. xiii. 12.

Extensores Carpi Radiales; the firſt ariſes from the Os Humeri immediately below the Supinator Radii Longus, and is inſerted into the metacarpal bone of the firſt finger; the ſecond ariſes immediately below this, from the outer extuberance of the Os Humeri, and is inſerted into the metacarpal bone of the ſecond finger. The firſt of theſe muſcles is a bender of the cubit as well as an extenſor of the Carpus, and its often acting with the benders of the cubit while the other is not in action, is the reaſon why it is ſo diſtinct from it.

Extensor Ulnaris, ariſes from the ſame extuberance with the former, and half the Ulna below the Anconeus muſcle; then becoming a tendon, runs in a ſmall Sinus at the bottom of the

Ulna, and is inſerted into the metacarpal bone of the little finger. See Ulna. page 36. The extenſors of the Carpus being inſerted into the Metacarpus at once perform the motion between the bones of the Carpus, and that between the Carpus and Radius. The Flexor and Tenſor Ulnaris acting together turn the hand downward, the Tenſor and Flexor Radialis upward.

Muſcles of the fingers.

PERFORATUS or FLEXOR SECUNDI INTERNODII DIGITORUM, ariſes from the inner tubercle of the Os Humeri, and from the upper part of the Ulna, and the middle of the Radius; then becoming four ſtrong tendons, paſſes under the Ligamentum Tranſverſale Carpi, and is inſerted into the beginning of the ſecond bone of each finger.

PERFORANS or FLEXOR TERTII INTERNODII DIGITORUM, ariſes from half the Ulna, and a great part of the ligament between the Ulna and Radius, then becoming four tendons, paſſes under the Ligamentum Tranſverſale Carpi, and through the tendons of the former muſcle to their inſertion into the third bone of each finger. The tendons of both theſe muſcles are tyed down to the finger by a ſtrong ligament. If theſe muſcles had not paſſed one through the other, the Perforatus, which is the leſſer muſcle, muſt have gone to the laſt joint, where the ſtronger muſcle is wanted; and beſides, the tendons of the ſecond joints would have preſſed thoſe that bend the laſt, and not lain firmly upon them neither.

Lumbricales or Flexores Primi Internodii Digitorum, ariſe from the tendons of the laſt mentioned muſcle, and are inſerted laterally toward the thumb into the beginning of the firſt bone of each finger.

Tab. xiii. 13. Extensor Digitorum Communis, ariſes from the outer extuberance of the Os Humeri, and paſſing under a ligament, at the wriſt, is divided into four tendons which communicate upon the firſt joint, which keeps them from ſliding off the joints of the fingers, where they are a little connected to the firſt bones, and afterward are inſerted into the beginning of the ſecond bone of each finger.

Extensor Auriclaris or Minimi Digiti, is a portion of the laſt muſcle paſſing under the ligament in a diſtinct chanel.

Extensor Indicis, ariſes from the middle of the Ulna, and paſſing under the ligament of the Carpus, is inſerted with the Extenſor Communis into the fore-finger. This muſcle extends the fore-finger ſingly. I have twice ſeen it wanting.

Abductor Primi Digiti, Interossei and Abductor Minimi Digiti, are eight muſcles, one for each ſide of each finger. Abductor Primi Digiti, ariſes from the firſt bone of the thumb, and the ſide of the metacarpal bone of the firſt finger. The Interossei, are three pair fitly divided into external and internal; the external ariſe from the metacarpal bones, whoſe ſpaces they fill up next the back of the hand; the internal ariſe from the ſame bones in the inſide of the hand. Abductor Mi-

NIMI DIGITI, ariſes from the tranſverſe ligament, and fourth bone of the Carpus; theſe muſcles are inſerted, two into the firſt joint of each finger, and then paſſing obliquely over the tops of the fingers are inſerted into their laſt bones; they bend the firſt joints, and extend the two laſt, as in holding a pen, and in playing upon ſome muſical inſtruments. The Abductors of the fore and little fingers, with the ſecond and fifth Interoſſei muſcles acting, the fingers are divaricated, and the other four acting bring them together, and theſe muſcles which divaricate the fingers, being extenders of the ſecond and third Joynts, we never can divaricate them without extending them a little.

ADDUCTOR OSSIS METACARPI MINIMI DIGITI, ariſes from the eighth bone and tranſverſe ligament of the Carpus, and is inſerted into the metacarpal bone of the little finger, which it pulls toward the thumb to conſtrict the palm of the hand.

Muſcles of the thumb.

EXTENSOR PRIMI INTERNODII POLLICIS, ariſes from the Ulna below the Anconeus muſcle, and the ligament between the Ulna and Radius; then becoming two, three, or four tendons is inſerted into the fifth bone of the Carpus, and firſt of the thumb. The firſt of theſe Inſertions can only aſſiſt the bending of the wriſt upward, and in turning the arm ſupine.

EXTENSOR SECUNDI INTERNODII POLLICIS, ariſes immediately below the former from the Radius and tranſverſe ligament, and is inſerted by a few fibres into the ſecond bone of the thumb, but chiefly into the third.

EXTENSOR TERTII INTERNODII POLLICIS, ariſes immediately below the laſt deſcribed, from the Ulna and ligament, and paſſes over the Radius nearer the Ulna to be inſerted at the third bone of the thumb. This extends the thumb more toward the Ulna than the former muſcle, and is very much a Supinator.

FLEXOR PRIMI & SECUNDI OSSIS POLLICIS, ariſes from the fifth bone and tranſverſe ligament of the Carpus, and from the beginnings of the two firſt metacarpal bones, and is inſerted into the whole length of the firſt bone of the thumb, and tendinous into the beginnings of the ſecond; the ſeſamoid bones of the thumb, in ſuch bodies as have them, lie in this tendon, where it paſſes over the joint.

FLEXOR TERTII INTERNODII POLLICIS, ariſes large from almoſt all the upper part of the Radius, and becoming a round tendon paſſes under the Ligamentum Tranſverſale Carpi to be inſerted into the third bone of the thumb. This muſcle ſingly acting, draws the thumb towards the metacarpal bone of the little finger; but the laſt mentioned muſcle acting with it, turns it toward the fore-finger.

ADDUCTOR POLLICIS, ariſes from the Carpus, and almoſt the whole length of the metacarpal bone of the long finger, and is inſerted into the beginning of the ſecond bone of thumb. This muſcle naturally enough divides into two, and might better be called a Flexor than Adductor.

ABDUCTOR POLLICIS, ariſes from the fifth bone and Ligamentum Tranſverſale of the Carpus, and is inſerted laterally in the beginning of the ſecond bone of the thumb to draw it toward the Radius.

THE muſcles which bend the thumb are much leſs than thoſe which bend the fingers; nevertheleſs, the thumb is able to reſiſt all the fingers, merely from the advantages that ariſe from the thickneſs and ſhortneſs of the bones of the thumb, compared with thoſe of the fingers; but then the quickneſs of motion in the fingers will exceed that of the thumb, as much as the fingers exceed the thumb in length, and their muſcles thoſe of the thumb in largeneſs.

Muſcles of the Radius.

SUPINATOR RADII BREVIS, ariſes from the outer extuberance of the Os Humeri and upper part of the Ulna, and running half round the Radius, is inſerted near its tubercle.

PRONATOR TERES, ariſes from the inner Apophyſis of the Os Humeri, and upper and forepart of the Ulna, and is inſerted tendinous into the Radius below the former.

PRONATOR QUADRATUS, ariſes from the lower edge of the Ulna near the Carpus, and paſſing under the flexors of the fingers, is inſerted into the Radius.

THESE muſcles are occaſionally aſſiſted in their actions by the muſcles of the hand; moſt of the extenſors aſſiſting the ſupinators, and moſt of the flexors the pronators, and moſt of the extenſors of the hand take a great part of their origin from the tendinous Faſcia that covers them.

Muſcles of the head and neck. Tab.xii.2.

MASTOIDEUS, ariſes tendinous from the Sternum near the Clavicula, and by a ſeparate fleſhy portion from the Clavicula, which ſoon unites with the other beginning, and is inſerted into the outer part of the mamillary proceſs of the temporal bone. It pulls that ſide of the head it is inſerted into towards the Sternum, and turns the face over the contrary ſhoulder. This with its fellow, pull the head and neck toward the breaſt, and act with a much longer lever upon each lower Vertebra, than they do upon the next above, and with more power upon any of thoſe bones than upon the head. This muſcle being inſerted into the head, beyond the center of motion of the head with the firſt Vertebra, has been ſuppoſed by Mr. Cowper, and others, to pull the head backward; but paſſing beyond ſignifies nothing to that purpoſe, unleſs a line paſſing through its Axis would paſs below the center of motion: And it is the more to be wondered how this miſtake prevailed, if we conſider that this muſcle's being added to the extenſors of the head and neck, would make the force of that action a hundred times greater than that of the benders. And if this is not enough to convince, let any one lying on his back raiſe his head, and he will ſoon feel this muſcle in action; but bowing the head forward in an erect poſture will not ſhew this, unleſs ſome reſiſtance is made to the head, becauſe the center of gravity of the head lying before the center of motion, there needs no more than a relaxation of the extenſors, to bring the head forward in that poſture.

Rectus Internus Major, ariſes from the anterior part of the tranſverſe proceſſes of the third, fourth, fifth and ſixth cervical Vertebræ; and paſſing over the two ſuperior, is inſerted into a roughneſs of the occipital bone near the forepart of the great Foramen. This bends the head on the two firſt Vertebræ of the neck.

Rectus Minor Internus, ariſes under the laſt muſcle, from the firſt Vertebra, and is inſerted under it into the Os Occipitis. This bends the head on the firſt Vertebra.

Rectus Lateralis, ariſes from the anterior part of the tranſverſe proceſs of the firſt Vertebra of the neck, and is inſerted into the Os Temporis and Occipitis between the mamillary and ſtyloid proceſſes. This turns the head to one ſide.

Splenius, ariſes by a thin tendon from the ſpinal proceſſes of the five ſuperior Vertebræ of the Thorax, and the loweſt of the neck, and Linea Alba Colli, and is inſerted into theOs Occipitis, the upper part of the Mamillary proceſs of the temporal bone, and the tranſverſe proceſſes of the three ſuperior cervical Vertebræ. This pulls the head and neck backward, and to the contrary ſide; but both of theſe acting together pull them directly backward.

Complexus, ariſe from the tranſverſe proceſſes of the ſix or ſeven ſuperior Vertebræ of the Thorax, and ſix inferior of the neck, and is inſerted into the Os Occipitis, and backpart of the

Os Temporis; this laſt part is ſometimes diſtinct enough to be accounted another muſcle: It pulls the head and neck back.

Rectus Major Posticus, ariſes from the ſpinal proceſſes of the ſecond Vertebra of the neck, and is inſerted broader into the Os Occipitis. It pulls the head back on the two firſt Vertebræ.

Rectus Minor Posticus, ariſes from the back-part of the firſt Vertebra of the neck, (it having no ſpinal proceſs) and is inſerted below the former into the ſame bone to pull the head back on the firſt Vertebra.

Obliquus Superior, ariſes from the tranſverſe proceſs of the firſt Vertebra, and is inſerted into the Os Occipitis and back-part of the Os Temporis near the Rectus Major; either of theſe acting, aſſiſt the Rectus Lateralis on the ſame ſide; but both together, pull the head back.

Obliquus Inferior, ariſes from the ſpinal proceſs of the ſecond Vertebra of the neck, and is inſerted into the tranſverſe proceſs of the firſt. This, with its fellow, alternately acting, turn the head with the firſt Vertebra in a rotatory manner on the ſecond, whoſe Proceſſus Dentatus is the Axis of this motion.

Interspinales Colli, are three or four pair of muſcles between the bifid proceſſes of the cervical Vertebræ, which they draw nearer each other when the neck is bent backward.

Longus Colli, ariſes laterally from the bodies of the four ſuperior Vertebræ of the Thorax,

and

and from the anterior part of the tranſverſe proceſſes of the five inferior Vertebræ of the neck, and is inſerted into the forepart of the firſt and ſecond Vertebræ of the neck, which it bends forward.

INTERTRANSVERSALES COLLI, are portions of fleſh between the tranſverſe proceſſes of the Vertebræ of the neck, like the Interſpinales, but not ſo diſtinct; they draw theſe proceſſes together.

SPINALIS COLLI, ariſes from the tranſverſe proceſſes of the five ſuperior Vertebræ of the back, and is inſerted into the ſpinal proceſſes of the ſecond, third, fourth and fifth Vertebræ of the neck. This pulls the neck backward.

TRANSVERSALIS COLLI, ariſes from the oblique proceſſes of the four inferior Vertebræ of the neck, and is inſerted into the ſpinal proceſs of the ſecond Vertebra of the neck. This muſcle is but a continuation of the Tranſverſalis or Semiſpinalis Dorſi.

THE muſcles of the head and neck are moſt of them obliquely directed, which makes them perform the oblique motions, as well as extenſion and flexion; which is highly convenient in this caſe, becauſe the joynts moved by theſe muſcles, being under the weight moved, it is neceſſary that the head ſhould be kept ſteady by the extenſors, and flexors too, when any great weight is upon the head; and theſe muſcles from the obliquity of their directions, not only perform theſe two actions at once, but acting by pairs they move the head and neck ſteadily, in a diagonal direction, which ſtraight muſcles could not have done ſo well.

Muſcles of the Thorax.

Scalenus ariſes from the tranſverſe proceſſes of the ſecond, third, fourth, fifth and ſixth cervical Vertebræ. It is inſerted in three parts, (being thus divided for the tranſmiſſion of the ſubclavian veſſels) into the two uppermoſt ribs. This muſcle may bend the neck, but its chief uſe is to ſupport its upper ribs, which is neceſſary to determine the contraction of the intercoſtal muſcles that way, and a ligament could not have done this, becauſe of the various poſitions that the neck and back are liable to.

Serratus Superior Posticus, ariſes with a thin tendon inſeparable from the Rhomboides, from the ſpinal proceſs of the inferior cervical Vertebra, and the three ſuperior of the Thorax, and is inſerted into the ſecond, third, and fourth ribs, immediately beyond their bendings; this, with the Scalenus, ſuſtains the upper ribs, that they might not be pull'd downward, by the depreſſors of the ribs in expiration, as the lower ribs are upward in inſpiration.

Serratus Inferior Posticus, ariſes with a broad tendon (inſeparable from that of the Latiſſimus Dorſi) from the ſpinal proceſſes of three ſuperior Vertebræ of the loyns, and two inferior of the Thorax, and is inſerted into the tenth rib, but chiefly the ninth and eleventh. It pulls down the ribs in exſpiration.

Intercostales, are eleven pair on each ſide, in the interſtices of the ribs; from their ſituations diſtinguiſhed into external and internal;

they all ariſe from the under edge of each rib, and are inſerted into the upper edge of the rib below. The external are largeſt backward, having their firſt beginnings from the tranſverſe proceſſes of the Vertebræ like diſtinct muſcles, which ſome call Levatores Coſtarum. The internal run all from above obliquely backward; being thickeſt forward, and thinneſt toward the ſpine. Theſe are alſo continued betwixt the cartilages of the Sternum, with fibres perpendicular to the Cartilages; and between the cartilages of the loweſt ribs, they are inſeparable from the Obliquus Aſcendens Abdominis. Theſe muſcles by drawing the ribs nearer to each other, pull them all upward, (they being ſuſtained at the top by the Scalenus and Serratus Superior Poſticus) and dilate the Thorax. To theſe Mr. Cowper adds ſome fleſhy fibres, which run from one rib over a ſecond to a third, near the ſpine, which are Levatores Coſtarum.

TRIANGULARIS STERNI, ariſes internally from the Cartilago Enſiformis, and the lower edge of the Os Pectoris, and is inſerted into the end of the third, fourth, fifth and ſixth ribs. This pulls the ribs to the bone of the Sternum, and thereby bends its cartilages in exſpiration.

DIAPHRAGMA, ariſes on the right ſide by a proceſs from three lumbal Vertebræ, and one of the Thorax; and on the left, from the one ſuperior of the loyns, and inferior of the Thorax; (this laſt part being leſs to give way to the great artery) and is inſerted into the lower part of the Sternum and the five inferior ribs. The middle of this muſcle is a flat tendon, from whence the fleſhy fibres begin, and are diſtributed, like Radii, from a center to a circumference. When this muſcle acts alone, it conſtricts the Thorax, and pulls the ribs downward, and approaches toward a plain; which action is generally performed to promote the ejection of the Fæces. In large inſpirations, when the intercoſtals lift up the ribs to widen the Thorax, this muſcle acts enough to bring it ſelf toward a plain without overcoming the force of the intercoſtals; by which means the breaſt is at once widened and lengthened: When it acts with the abdominal muſcles it draws the ribs nearer together, and conſtricts the Thorax, and the ſuperior force of the abdominal muſcles thruſting the parts of the lower belly againſt it, it becomes at the ſame time convex upward, and ſhortens the Thorax, which occaſions the largeſt exſpirations; or acting alternately with the abdominal muſcles only, a more moderate inſpiration and exſpiration is made by ſhortening and lengthening the Thorax only, which is what we chiefly do when lying down; or acting alternately with the intercoſtals only, a moderate exſpiration and inſpiration is cauſed by the widening and narrowing the breaſt, which is what we are moſt prone to in an erect poſition, the muſcles of the Abdomen, at ſuch times, being employed in ſupporting the parts contained in the Abdomen. And though theſe motions of the ribs require at any one time but very little force, the air within the Thorax balancing that without; yet that theſe muſcles whoſe motions are eſſential to life may be never weary, the inſpirators in moſt men have force ſufficient to raiſe mercury in a tube four or five and twenty inches, in an erect poſture, and the exſpirators ſix or ſeven; the firſt of which will require about four thouſand pound force in moſt men, and the other proportional. But I imagine, that lying down, theſe proportions will differ by the weight of the parts contained in the Abdomen. In all the bodies I have diſſected, I have found the diaphragm convex upward, which gave me occaſion to think, that all animals died in exſpiration, till the forementioned experiment diſcovered, that the muſcles of inſpiration were ſtronger than thoſe of exſpiration; which led me to make the following experiment. I cut the wind-pipe of a dog, and having a ſtring ready fixed, I put a cork into it, and tyed it faſt inſtantly after inſpiration; upon which I obſerved, that the diaphragm, and the other muſcles of inſpiration and exſpiration were alternately contracted, and diſtended for ſome time; but when he was dead, the abdominal muſcles were in a ſtate of contraction, the ribs were elevated to dilate the Thorax, and the diaphragm was convex upward; this experiment alſo ſhews, that the diaphragm is not a muſcle of equal force either to the depreſſors or elevators of the ribs, it neither hindering the elevators from raiſing the breaſt; nor the depreſſors from thruſting it upward, by compreſſing the parts contained in the Abdomen, though the breaſt was full of air.

Muſcles of the loins, back and neck.

SACER SACROLUMBALIS, LONGISSIMUS DORSI, and SEMISPINALIS, are all that portion of fleſh betwixt the Os Sacrum and the neck, which, ſeeing there is no membrane to diſtinguiſh it into ſeveral muſcles, and that it is all employed in the ſame actions, I ſhall give it the name of Extenſor Dorſi & Lumborum, and deſcribe it all as one muſcle.

EXTENSOR DORSI & LUMBORUM, ariſes from the upper part of the Os Sacrum, the ſpine of the Os Ilium, the back-part of the lowermoſt Vertebræ of the loins, and remarkably from thoſe ſtrong tendons which appear on their outſides. That part of this muſcle which is known by the name of Sacrolumbalis is inſerted into all the ribs near their articulations, with the tranſverſe proceſſes of the Vertebræ, and into the tranſverſe proceſs of the laſt Vertebra of the neck; beſides, as this paſſes over the ribs, it receives an origin from every rib, in a manner that cannot well be deſcribed: The portions of this muſcle which ariſe from the ribs, and are inſerted into other ribs above will neceſſarily draw the back-part of the ribs nearer together, which muſt always be done as the back extends, and independent of other actions of the Thorax. The next portion of this muſcle, called Longiſſimus Dorſi, is inſerted into all the tranſverſe proceſſes of the Vertebræ of the back, and partly into the ribs, and the uppermoſt tranſverſe proceſſes of the Vertebræ of the loins; and the upper end of it is neither very diſtinct from the Complexus of the head, nor Spinalis of the neck. The reſt of this muſcle, known by the names of Semiſpinalis, Sacer, &c. ariſes alſo from all the tranſverſe and oblique proceſſes of the loins and back; every portion, except the lowermoſt, paſſing over five joints, is inſerted into the ſpinal proceſs of the ſixth Vertebra above its origin, all the way up the back, and at the neck commences Tranſverſalis Colli: This paſſing of each portion of a muſcle over a few joints, diſtributes their force equally enough among all theſe joints, without the fibres being directed more obliquely than thoſe of penniform muſcles; but the neck and loins not having ſufficient proviſion of this ſort, there are ſmall muſcles between their proceſſes, which though they are of little importance for the motions of thoſe parts, yet are ſufficient to diſtribute the force of larger muſcles equally among thoſe joints; and beſides the uſes of the Extenſor Dorſi & Lumborum, which its name implies, it, and its fellow, alternately raiſe the hips in walking, which any one may feel by laying his hand upon his back.

Muſcles of the loins.

QUADRATUS LUMBORUM, ariſes from the upper part of the ſpine of the Ilium, and is inſerted into all the tranſverſe proceſſes of the four uppermoſt lumbal Vertebræ. This, with its fellow, acting alternately, aſſiſt the laſt mentioned muſcle in raiſing the Oſſa Innominata in progreſſion: Or each acting ſingly, while the lower limbs are not moved, inclines the body to one ſide.

INTERTRANSVERSALES LUMBORUM, are ſmall muſcles ſeated between all the tranſverſe proceſſes of the Vertebræ Lumborum, to bring them nearer together.

Psoas Parvus, ariſes laterally from the body of the firſt lumbal Vertebra, and the loweſt of the back, and ſoon becoming a ſmall tendon, is inſerted into the Os Pubis near the Ilium. It either aſſiſts in bending the loins forward, or raiſing the Os Innominatum in progreſſive motions. This muſcle is often wanting.

Muſcles of the thigh.

Psoas Magnus, ariſes laterally from the bodies and tranſverſe proceſſes of the four ſuperior Vertebræ of the loins, and the laſt of the back, and is inſerted with the following muſcle into the leſſer Trochanter. This bends the thigh, and when the Pſoas Parvus is wanting this is larger.

Iliacus Internus, ariſes from the concave part of the Ilium, and from its lower edge, and paſſing over the Ilium near the Os Pubis, joins the former muſcle, and is inſerted with it, to be employed in the ſame action.

Pectineus, ariſes from the Os Pubis or Pectinis, near the joining of that bone with its fellow, and is inſerted into the Linea Aſpera of the thigh-bone, four fingers breadth below the leſſer Trochanter. This bends the Thigh and turns the toes outward.

Triceps Femoris, the two leſſer heads of this muſcle ariſe under the Pectineus, and the third from the inferior edges and back-part of the Os Pubis and Iſchium, and is inſerted into the whole length of the Linea Aſpera and the inner Apophyſis of the Os Femoris. This alſo bends the thigh and turns the toes outward. When the thigh-bone is moved in a plain, which cuts at right angles a plain that paſſes through the Axis of either head of the laſt muſcle, that head riſing lower than the center of motion of the hip-joint, it will equally aſſiſt both the flexors and extenſors, and that moſt when the bone has been moved moſt backward or forward; and as either of theſe heads lie more or leſs out of the ſaid plain, they will give greater aſſiſtance to that motion which is made on the ſide of the ſaid plain, contrary to their ſituation, and leſs on the ſame ſide. This mechaniſm is frequently made uſe of to make one muſcle ſerve different actions; but I have only explained it in this inſtance, becauſe it is the moſt conſiderable one that I know.

GLUTEUS MAXIMUS, ariſes from the back-part of the ſpine of the Ilium, and the Dorſum Ilii, and ſide of the Os Coccygis and Sacrum, and a ligament extended between theſe bones, and from a thin Faſcia ſpread over that part of the following muſcle, which this does not cover, and is inſerted by a ſtrong tendon into the upper part of the Linea Aſpera of the thigh-bone, and alſo into the flat tendon of the Faſcialis muſcle, which inſertion into, or connection with, that tendon raiſes this muſcle farther from the center of motion and encreaſes its ſtrength. This extends the thigh, and both theſe together being contracted, occaſionally aſſiſt the Levatores Ani in ſupporting the Anus. The breadth of the origin and inſertion of this muſcle, is very obſervable, for by that means though it is the largeſt muſcle in the body, it is nevertheleſs right-lined without one fibre compreſſing another any more than in penniform muſcles.

GLUTEUS MEDIUS, ariſes from all the anterior part of the ſpina and Dorſum Ilii, and under part of the laſt mentioned muſcle, and is inſerted into the upper part of the great Trochanter of the thigh-bone. This extends the thigh outward.

GLUTEUS MINIMUS, ariſes entirely under the former, from the Dorſum Ilii, and is inſerted into the upper and anterior part of the great Trochanter and neck of the thigh-bone to extend the thigh.

PYRIFORMIS, ariſes internally from the inſide of the Os Sacrum, and growing in more than half its progreſs into a round tendon, is inſerted into the upper part of the ſinus at the root of the great Trochanter. This aſſiſts ſomewhat in extending the thigh, but more in turning it outward.

QUADRATUS FEMORIS, ariſes from the obtuſe proceſs of the Iſchium, and is inſerted into the upper part of the Linea Aſpera of the thigh-bone, between the two Trochanters. This draws the thigh inward, and directs the toes outward.

OBTURATOR INTERNUS, or MARSUPIALIS, ariſes generally from a ſtrong membrane or ligament, which fills up the hole of the Os Innominatum, and from the circumambient bone; thence paſſing over a channel in the Iſchium betwixt its two proceſſes, it receives from them two other portions, which are a ſort of Marſupium;

and is inſerted into the Sinus of the great Trochanter. This turns the thigh outward.

OBTURATOR EXTERNUS, ariſes oppoſite to the former, from the outſide of the Os Innominatum, and is inſerted into the Sinus of the great Trochanter. This alſo turns the thigh outward. Theſe four laſt mentioned muſcles acting with the extenſors, prevent their turning the toes inward, and in ſtepping forwards are continually acting to turn the toes outwards; for though the toes are placed perpendicular to the front of the body, in taking a long ſtep, theſe muſcles bring them perpendicular to the ſide of the body; and as theſe direct, the ſame extenſors will turn the thigh either outward or backward, with their full force.

Muſcles of the Tibia.

FASCIALIS or MEMBRANOSUS, ariſes from the forepart of the ſpine of the Ilium, and in about five inches progreſs becomes a flat tendon or Faſcia, which is joined by a conſiderable detachment from the tendon of the Gluteus Maximus, and from the Linea Aſpera of the thigh-bone, and then covering in an eſpecial manner the Vaſtus Externus is inſerted at the top of the Tibia and Fibula, and then proceeds to join the Faſcia, which covers the upper part of the muſcles ſituate on the outſide of the Tibia, and from which a great part of the fibres of thoſe muſcles ariſe. About the middle of the leg it grows looſe, and is ſo continued to the top of the foot, being connected there and at the lower part of the leg, to the ligaments which tie down the tendons; this tendon, where it covers the Vaſtus

Externus, receives additional tranſverſe fibres, which run round the thigh, but are moſt conſpicuous on the outſide. This draws the thigh outward, and paſſing over the knee forwarder than its Axis of motion, it will help to extend that joint.

Gracilis, ariſes from the Os Pubis cloſe to the Penis, and is inſerted into the Tibia four or five fingers breadth below the knee. This draws the thigh inward, and paſſing over the knee behind its Axis of motion, it will help to bend it.

Sartorius, ariſes from the fore-part of the ſpine of the Ilium, and thence deſcending obliquely to the inſide of the Tibia is there inſerted four or five fingers breadth below the joint. This at once helps to bend both the thigh and leg, (particularly the thigh) at very long levers: it directly helps to lift up the leg in walking up ſtairs, or laying the legs acroſs like taylors.

Semitendinosus, ariſes from the obtuſe proceſs of the Iſchium, and growing a round tendon in ſomewhat more than half its progreſs, is inſerted near the former muſcles into the Tibia; it helps to extend the thigh and bend the Tibia.

Semimembranosus, ariſes by a flat tendon like a membrane from the obtuſe proceſs of the Iſchium, and being continued tendinous betwixt the bellies of the laſt mentioned and following muſcles, and then growing fleſhy, becomes again tendinous above the joint, and is inſerted nearer the joint than the former muſcle for the ſame uſe.

These two make the internal hamſtring, and ariſing and inſerting ſo near together, they might have been one muſcle, but their fibres would have been near twice as long, which would have given a motion near twice as quick, but not ſo ſtrong, unleſs it had been inſerted at a diſtance from the joint it moves proportionable to its length, which could not well be, therefore they are made two muſcles of a number of fibres nearly equal to what one could have been, and are inſerted at diſtances from the Axis of motion of the knee, proportional to the different lengths of their fibres in the directions of their Axes.

Biceps Tibiæ, the firſt head ariſes in common with the two preceding muſcles, from the obtuſe proceſs of the Iſchium: the ſecond from the lower part of the Linea Aſpera of the thigh-bone; this ſoon joins the former, and is inſerted with it into the upper part of the Fibula to bend the leg, and the firſt head alſo extends the thigh. The tendon of this muſcle makes the external hamſtring, when the knee is bent, and when we ſit down, the Biceps will turn the leg and toes outward, and the Semitendinoſus and Semimembranoſus will turn them inward.

Popliteus, ariſes from the outer Apophyſis of the Os Femoris, and thence running obliquely inward, is inſerted into the Tibia immediately below its head. This aſſiſts the flexors, and draws the Tibia toward the outer Apophyſis of the thigh-bone.

Rectus Tibiæ, ariſes with a tendon from the upper part of the Acetabulum of the Os Innominominatum, and by another tendon (which is a ſort of ligament to this) from a Proceſſus Innominatus of the Illium below its ſpine forward, and is inſerted together with the three following muſcles into the Patella. It bends the thigh, and extends the Tibia.

Vastus Externus, ariſes from the anterior part of the great Trochanter and upper part of the Linea Aſpera of the thigh-bone, and is inſerted into the upper and external part of the Patella. It extends the Tibia.

Vastus Internus, ariſes from the inner and lower part of the Linea Aſpera, and is inſerted into the upper and inner part of the Patella, to extend the Tibia; and the fibres of this muſcle being oblique, it keeps the Patella in its place, the other muſcles lying in the direction of the Os Femoris, which makes an obtuſe angle with the Tibia, they would alone be liable to draw the Patella outward. This contrivance is moſt obvious in thoſe whoſe knees bend moſt inward.

Crureus, ariſes between the two laſt below the Rectus, from all the convex part of the Os Femoris, and is inſerted in like manner into the Patella; the Patella being tied down by a ſtrong ligament to the Tibia. Theſe three laſt muſcles extend the Tibia only, and might very properly be called, Extenſor Tibiæ Triceps.

When the Patella is ſo broke tranſverſe that the part into which the muſcles are inſerted is diſtinctly ſeparated from that by which the ligament is fixed, the fracture can never be well cured, becauſe the muſcles will keep the parts aſunder; but when the fracture is otherwiſe, it admits of a better cure.

Muſcles of the Tarſus.

GASTEROCNEMIUS, ariſes by two ſmall beginnings above the back-part of the Apophyſes of the Os Femoris, which ſoon becoming large bellies unite, and then become a flat tendon which joins the following muſcles to be inſerted into the Os Calcis. The two parts of this muſcle, are by ſome writers diſtinguiſhed into two muſcles. Its uſe is to extend the Tarſus and bend the knee.

PLANTARIS, ariſes under the outer beginning of the laſt named muſcle, from the external Apophyſis of the Os Femoris, and ſoon becoming a ſmall tendon, is ſo continued betwixt the foregoing and ſubſequent muſcles, and is inſerted with them. It bends the knee and extends the Tarſus. Authors derive the tendinous expanſion on the bottom of the foot from the tendon of this muſcle; but ſeeing the expanſion is much more than this tendon could make, and that this tendon can be traced no farther than the Os Calcis, and that the expanſion is as large when the muſcle is wanting, which is not ſeldom, I cannot be of that opinion.

GASTEROCNEMIUS INTERNUS, ariſes from the upper part of the Tibia, and one third of the Fibula below the Popliteus, and is inſerted with the two foregoing muſcles by a ſtrong tendon into the upper and back-part of the Os Calcis. This muſcle only extends the Tarſus.

TIBIALIS ANTICUS, ariſes from the upper and exterior part of the Tibia, and is inſerted laterally into the Os Cuneiforme Majus of the Tarſus, and by a ſmall portion of its tendon into the metacarpal bone of the great toe. This bends and turns the Tarſus inward.

TIBIALIS POSTICUS, ariſes firſt by a ſmall beginning from the upper part of the Tibia between that bone and the Fibula, then paſſing between the bones through a perforation in the tranſverſe ligament which connects thoſe bones, it takes other beginnings from the upper and middle part of the Tibia, and from the middle of the Fibula, and the ligament betwixt the Tibia and Fibula; then growing a round tendon, paſſes under the inner ancle, and is inſerted into the lower part of the Os Naviculare, and into the Os Cuneiforme Majus. This extends and turns inward the Tarſus.

PERONEUS LONGUS, ariſes from the upper and outer part of the Fibula, and growing a tendon toward the lower part of this bone, paſſes under the outer ancle, and the muſcles ſituated on the bottom of the foot, and is inſerted into the beginning of the metatarſal bone of the great toe, and the Os Cuneiforme next that bone. This turns the Tarſus outward, and directs the force of the other extenſors of the Tarſus toward the ball of the great toe.

PERONEUS BREVIS, ariſes from the middle of the Fibula, under a part of the former, and growing tendinous, paſſes under the outer ancle, and is inſerted into the beginning of the upper part of the Os Metatarſi of the little toe, and ſometimes beſtows a ſmall tendon on the little toe. Its uſe is to extend the Tarſus, and turn it outward.

THESE two laſt muſcles riding over the lower end of the Fibula, are often the cauſe of a ſprain in the outer ancle, when they are vehemently exerted, to ſave a fall.

Muſcles of the great toe.

EXTENSOR POLLICIS LONGUS, ariſes from the upper and middle part of the Fibula and Ligamentum Tranſverſale, and ſoon becoming a ſtrong tendon, is inſerted into the laſt bone of the great toe. This alſo bends the Tarſus with a much longer lever than it extends the toe.

EXTENSOR POLLICIS BREVIS, ariſes from the fore-part of the Os Calcis, and is inſerted into the ſame place with the former.

FLEXOR POLLICIS LONGUS, ariſes from the Fibula, oppoſite to the Extenſor Longus, and then paſſing under the inner ancle, is inſerted to the under ſide of the laſt bone of the great toe. This extends the Tarſus at a longer lever than it bends the toe.

FLEXOR BREVIS, and ADDUCTOR POLLICIS, are the ſame muſcle, ariſing from the two leſſer Oſſa Cuneiformia and Os Cuboides, and Calcis; they are inſerted into the Oſſa Seſamoidea, which are tied by a ligament to the firſt bone of the great toe, reckoning only two bones to the great toe. Theſe muſcles bend the great toe.

ABDUCTOR POLLICIS, ariſes pretty large from the inner and back-part of the Os Calcis, and by a ſmaller beginning from the Os Naviculare; thence paſſing forward contiguous to the Os Cuneiforme majus, paſſes by the external ſeſamoid bone of the great toe to its inſertion into the firſt bone of the great toe. This muſcle is leſs an Abductor than a Flexor Pollicis Pedis; it alſo very much helps to conſtrict the foot lengthways.

TRANSVERSALIS, PEDIS, ariſes from the lower end of the metatarſal bone of the toe next the leaſt, and is inſerted into the internal ſeſamoid bone. This is truly an Adductor of the great toe, and helps to keep the conſtricture of the bottom of the foot.

Muſcles of the leſſer toes.

EXTENSOR DIGITORUM PEDIS LONGUS, ariſes acute from the upper part of the Tibia, and from the upper and middle part of the Fibula and ligament between theſe bones; then dividing into five tendons, four of them are inſerted into the ſecond bone of each leſſer toe, and the fifth into the beginning of the metatarſal bone of the leaſt toe, and ſometimes by a ſmall tendon alſo into the little Toe. This laſt portion, for the moſt part is ſeparate, from its beginning, and may be accounted a diſtinct muſcle. The four firſt tendons only of this muſcle extend the toes, but all five bend the Tarſus, and that with a longer lever than any of them bend a toe.

EXTENSOR DIGITORUM BREVIS, ariſes together with the Extenſor Pollicis Brevis from the Os Calcis, and dividing into three ſmall tendons is inſerted into the ſecond joint of the three toes next the great one. The long extenſors of the toes ſerve not only to extend them, but alſo contribute to the bending of the ancle, which motions are uſually performed together in progreſſion; but the ſhort extenſors ariſing below the ancle, extend the toes only; and when the long extenſors are employed for that action only, the extenſors of the Tarſus muſt act at the ſame time, to prevent the bending of the ancle; this is the reaſon why the toes have need, tho' their motions are leſs, of more extenſors than the fingers.

Flexor Brevis or Perforatus, ariſes from the under and back-part of the Os Calcis, thence paſſing toward the four leſſer toes, divides into four tendons, which are inſerted into the beginning of the ſecond bone of each of the leſſer toes. Theſe tendons are divided to let through the tendons of the following muſcle.

Flexor Longus or Perforans, ariſes from the back-part of the Tibia, above the inſertion of the Popliteus, and part of the Fibula; thence deſcending under the Os Calcis to the bottom of the foot becomes tendinous, which part croſſes, and, in moſt bodies, communicates with the Flexor Longus Pollicis Pedis; then it divides into four tendons, which paſſing thro' thoſe of the Flexor Brevis are inſerted into the third bone of each of the four leſſer toes. This muſcle alſo extends the Tarſus. The ſecond beginning of this muſcle ariſes from the Os Calcis, and joins the tendons where they divide. This portion only bends the toes; and ſeeing the Flexor Longus of the toes will, when it acts alone, extend the Tarſus as well as bend the toes, this portion (like the ſhort extenſors of the toes) ſeems purpoſely contrived to bend the toes alone.

LUMBRICALES, ariſe from the tendons of the Perforans, and are inſerted into the firſt bone of each of the leſſer toes, which they bend.

ABDUCTOR MINIMI DIGITI PEDIS, ariſes by the Perforatus from the Os Calcis, and being part of it inſerted into the metacarpal bone of the leaſt toe, it receives another beginning from the Os Cuboides, and is inſerted into the firſt bone of the leaſt toe, which it bends and pulls outward, and very much helps to conſtrict the bottom of the foot.

ABDUCTOR SECUNDUS MINIMI DIGITI, this ariſes under the former muſcle from the metatarſal bone, and is inſerted into the little toe.

INTEROSSEI, are ſeven muſcles which lie like thoſe of the hands, and ariſe like them from the metatarſal bones, and are inſerted like them into the laſt joints of the four leſſer toes, and being in their progreſs attached to the tendons which extend the ſecond joints of the toes, they will extend both theſe joints. Theſe muſcles may be fitly divided into external and internal, the internal alſo bend the firſt joints, as do all the Interoſſei in the hand, but here the outer ones extend the firſt joints; and if we conſider that the firſt of theſe muſcles is analagous to the Abductor Indicis of the hand, and that the Abductor Minimi is alike in both, we find that the muſcles to move the fingers and leſſer toes ſideways are alike in number, though this motion of the toes is in a manner loſt from the uſe of ſhoes. The muſcles that bend or extend the laſt joints of the toes will alſo move the ſecond and firſt, and thoſe that move the ſecond will alſo move the firſt. The ſame remark ſhould have been made about the muſcles of the fingers.

THOUGH a great many authors have thought it worth while to contend in many inſtances which ſhall be called the origin, and which the inſertion of ſome muſcles, whoſe ends have been both liable to be moved, yet none of them have conſidered, that every extenſor of the thigh, Tibia, and Tarſus, has always had that end which is moſt moved called its origin, and the other its inſertion; contrary to the rule which all have laid down to judge by.

THE number of the muſcles cannot be adjuſted, becauſe anatomiſts are neither agreed about ſome of them, whether they ſhould be counted muſcles or not, nor of others how far they ſhall be divided; though in the main, they ſeem to think him the beſt anatomiſt who divides them moſt; for my own part, I am not for dividing them as far as they can be divided, but as far as is neceſſary to the knowledge of their uſes.

TABLE XI.

Figure 1. A rectilineal muſcle.

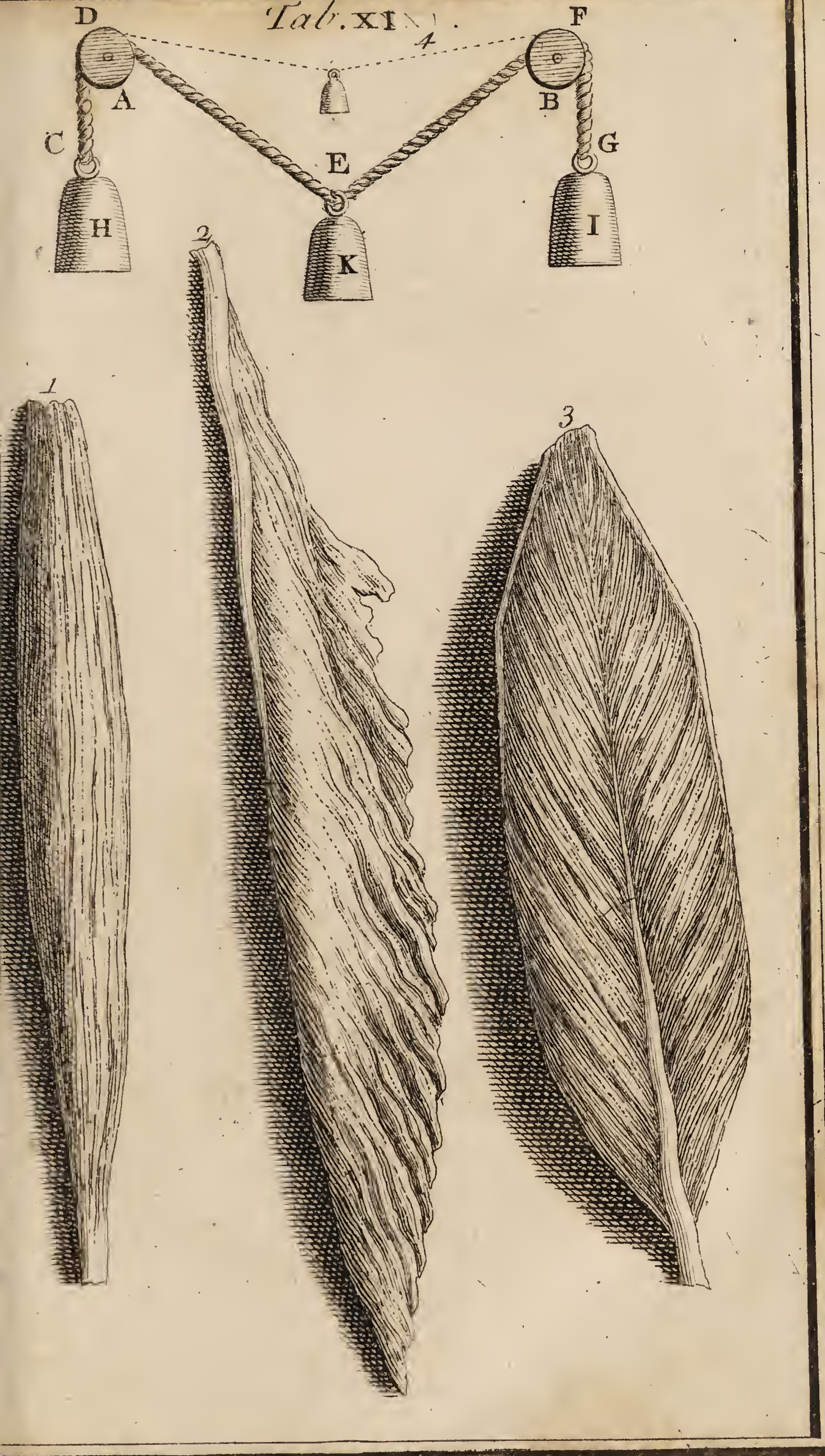
Fig. 2. A ſingle penniform muſcle.

Fig. 3. A double penniform muſcle.

Fig. 4. Is a ſcheme to explain the different properties of rectilineal and penniform muſcles.

AB, are two pullies, about which the chord CDEFG is inflected. H I, are two equal weights, hung in a perpendicular direction at each end of this Chord. K, is another weight hung at E, the middle of that part of the chord which lies between the pullies. When the weight K, and the weights HI balance each other, the coſine of half the angle DEF, bears the ſame proportion to the Radius, as the weight K bears to the ſum of the weights H and I: So that the weight K, muſt never be ſo great as the ſum of the weights HI; and the leſs the weight K is, the greater will be the angle DEF, when the weights are in Equilibrio. Beſides, if the weight K be raiſed directly upwards, the velocity wherewith the weight K is made to aſcend, will be to the velocity wherewith each of the weights HI will deſcend, as the Radius to the coſine of half the angle DEF.

Tab. XIV.



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TAB. XII *Pag.*

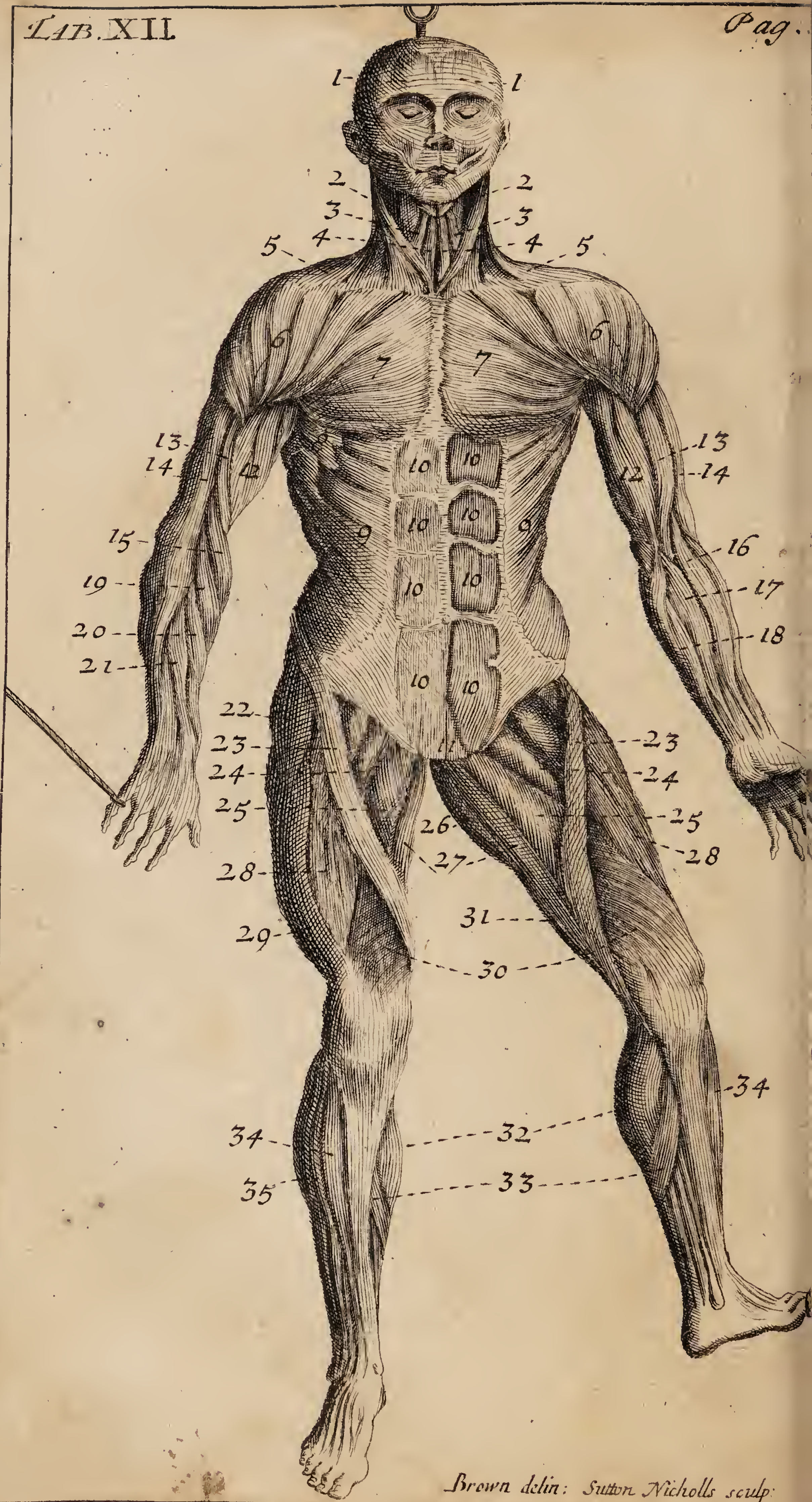

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TABLE XII.

1. Frontalis.
2. Maſtoideus.
3. Coracohyoideus.
4. Sternohyoideus.
5. A ſmall part of the Trapezius.
6. Deltoides.
7. Pectoralis.
8. Part of the Serratus Major Anticus.
9. Obliquus Deſcendens Abdominis.
10. The portions of the Recti, the left being diveſted of its Faſcia.
11. Pyramidales.
12. Biceps Cubiti Flexor.
13. Bracheus Flexor.
14. Triceps Extenſor Cubiti.
15, 16. Supinator Radii Longus.
17. Flexor Carpi Radialis.
18. Flexor Carpi Ulnaris.
19. The firſt head of the Extenſor Carpi Radialis.
20. The ſecond head of the ſame muſcle.
21. Extenſor Digitorum Communis.
22. Faſcialis or Membranoſus.
23. Sartorius.
24. One head of the Triceps.
25. Pectineus.
26. The great head of the Triceps.
27. Gracilis.
28. Rectus.
29. Vaſtus Externus.

30. Vaſtus Internus.
31. Semitendinoſus.
32. Gaſterocnemeus Externus.
33. Soleus, or Gaſterocnemeus Internus.
34. Tibialis Anticus.
35. Tenſor Pollicis Pedis Longus.

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TAB. X

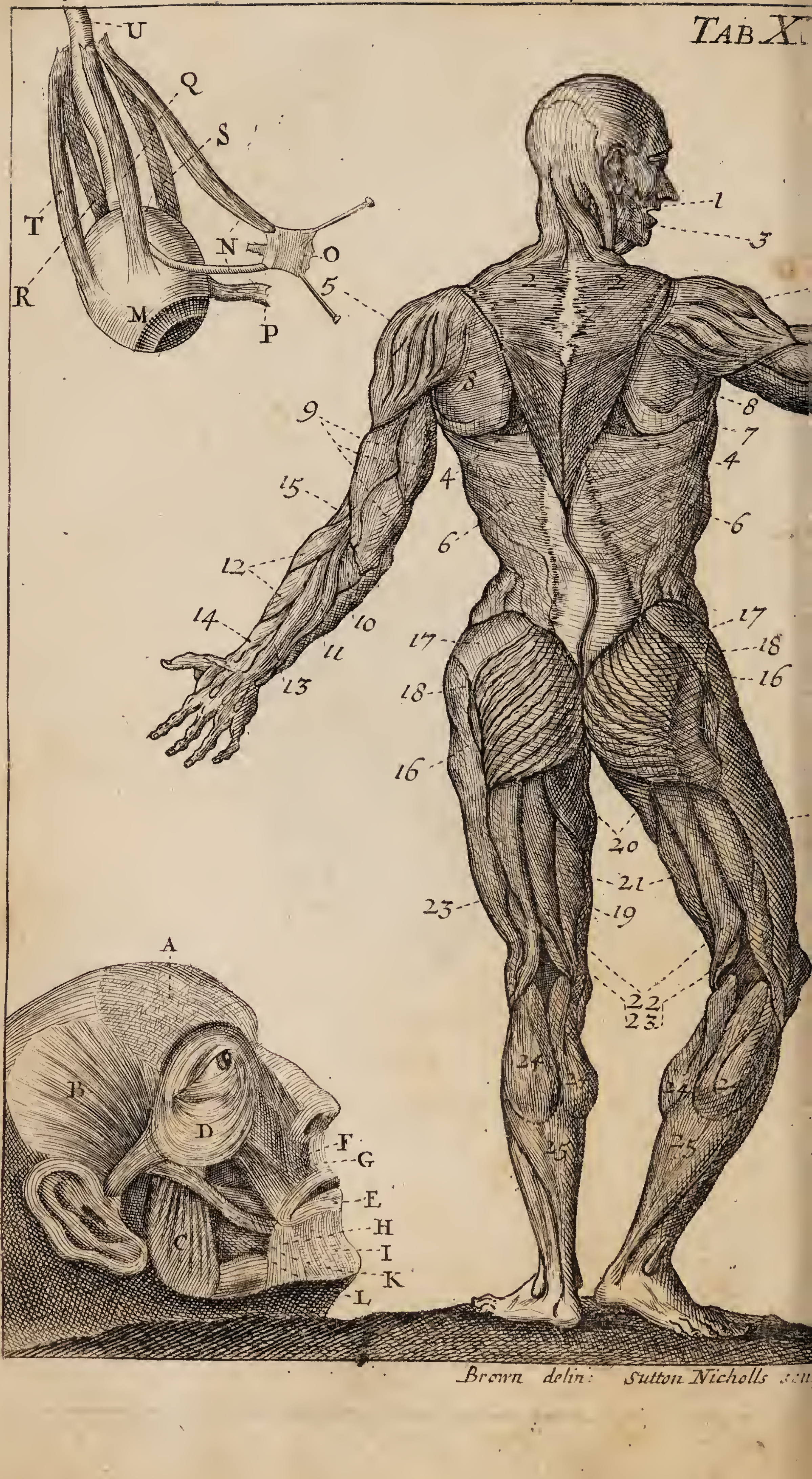

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TABLE XIII.

Muſcles of the Face.

A, Frontalis.
B, Temporalis.
C, Maſſeter.
D, Orbicularis.
E, Sphincter Oris.
F, Elevator Labii Superioris Proprius.
G, Elevator Labiorum Communis.
H, Depreſſor Labiorum Communis.
I, Depreſſor Labii Inferioris Proprius.
K, Zygomaticus.
L, Buccinator.
M, *The right eye with its muſcles.*
N, Obliquus Superior.
O, The Trochlea through which it paſſes.
P, Obliquus Inferior.
Q, Elevator Oculi.
R, Depreſſor Oculi.
S, Adductor Oculi.
T, Abductor Oculi.
U, The optick nerve.

A view

A view of the poſterior external muſcles.

1. Maſtoideus.
2. Trapezius.
3. A very ſmall part of the Elevator Scapulæ.
4. A very ſmall part of the Rhomboides.
5. Deltoides.
6. Latiſſimus Dorſi.
7. Teres Major.
8. Infraſpinalis Scapulæ.
9. Triceps extenſor Cubiti.
10. Anconeus.
11. Extenſor Carpi Ulnaris.
12. Extenſor Carpi Radialis.
13. Extenſor Digitorum Communis.
14. Extenſor Primi Internodii Pollicis.
15. A very ſmall part of the Supinator Radii Longus.
16. Gluteus Maximus.
17. Gluteus Medius.
18. Membranoſus or Faſcialis.
19. Gracilis.
20. The great head of the Triceps.
21. Semimembranoſus.
22. Semitendinoſus.
23. Biceps Tibiæ.
24. Vaſtus Externus.
25. Gaſterocnemeus Externus.
26. Soleus, or Gaſterocnemeus Internus.

BOOK III.

CHAP. I.

Of the external parts, and common integuments.

THE vulgar names of the external parts of the human body being ſufficiently known for the deſcription of any diſeaſe or operation; I ſhall only deſcribe thoſe which anatomiſts have given for the better underſtanding of the ſub-contained parts.

The hollow on the middle of the Thorax, under the breaſts, is called Scrobiculus Cordis. The middle of the Abdomen for about three fingers breadth above and below the navel, is called Regio Umbilicalis. The middle part above this, Epigaſtrium. On each ſide of the Epigaſtrium, under the cartilages of the lower ribs, Hypochondrium; and from below the Regio Umbilicalis down to the Oſſa Ilia, and Oſſa Pubis, Hypogaſtrium.

Cuticula or Scarf-Skin, is that thin inſenſible membrane which is raiſed by bliſters in living bodies: It is extended over every part of the true ſkin, unleſs where the nails are. It appears to me in a microſcope a very fine ſmooth membrane, only unequal where the Reticulum Mucoſum adheres to it. Lewenhoeck and others, ſay, it appears ſcaly, and compute that a grain of ſand of the hundredth part of an inch diameter, will cover two hundred and fifty of theſe ſcales, and that each ſcale has about five hundred pores; ſo that according to them, a grain of ſand will cover 125000 pores, through which we perſpire. Its uſe is to defend the true ſkin that it may not be expoſed to pain from whatever it touches; and alſo to preſerve it from wearing: It is thickeſt on thoſe parts of the bottom of the foot which ſuſtain the body; and in hands much uſed to labour, being ſo contrived as to grow the thicker, the more thoſe parts are uſed.

Between this and the true ſkin, is a ſmall quantity of ſlimy matter, which was ſuppoſed, by Malpighi, and others, to be contained in proper veſſels, interwoven with one another, and therefore by them named Reticulum Mucoſum. It is moſt conſiderable where the Cuticula is thickeſt, and is black, white, or duſky, ſuch as is the complexion; the colour of this, and the Cuticula, being the only difference between Europeans, and Africans or Indians, the fibres of the true ſkin being white in all men; but the florid colour of the checks, is owing to the blood in the minute veſſels of the ſkin, as that in the lips to the veſſels in the muſcular fleſh; for the Cuticula (as I imagine) being made of excrementitious matter, has no blood veſſels.

CUTIS or TRUE SKIN, is a very compact, ſtrong, and ſenſible membrane extended over all the other parts of the body, having nerves terminating ſo plentifully in all its ſuperficies, for the ſenſe of touching, that the fineſt pointed inſtrument can prick no where without touching ſome of them. Theſe nerves are ſaid by Malpighi, and others, who have examined them carefully, to terminate in ſmall pyramidal Papillæ; nevertheleſs to me it ſeems, that a plain ſuperficies of the ſkin (I do not mean mathematically plain) is much fitter and more agreeable to what we experience of this ſenſation; for a plain ſuperficies expoſing all the nerves alike, I think would give a more equal ſenſation, while nerves ending in a pyramidal Papilla would be exceeding ſenſible at the Vertex of that Papilla; and thoſe at the ſides and round the baſe, which would be far the greateſt part, would be the leaſt uſeful.

GLANDULÆ MILIARES, are ſmall bodies like millet ſeeds, ſeated immediately under the ſkin in the Axillas; and are ſaid to have been found under all other parts of the ſkin, where they have been looked for with microſcopes: Theſe glands are ſuppoſed to ſeparate ſweat; which fluid was formerly thought to be only the Materia Perſpirabilis flowing in a greater quantity, and condenſed; but Sanctorius has aſſured us, that it is not ſo, and that more of the Materia Perſpirabilis is ſeparated in equal times than of ſweat; of the former, he ſays, uſually fifty two ounces a day in Italy, where his experiments were made, and of the latter not near ſo much in the moſt profuſe ſweats; which, I think, favours the opinion of the exiſtence of theſe glands, unleſs the ſweat being once condenſed upon the ſkin, prevents a greater effuſion of that matter. Now that the whole body, every part of which is ſurely perſpirable (or how elſe could extravaſated blood or matter ever be diſſipated, unleſs it could be abſorbed into the veſſels, which ſeems impoſſible, ſeeing that the fluids which are in motion in the veſſels muſt out-balance thoſe which are extravaſated) ſhould perſpire fifty two ounces in a natural day, is not at all incredible. But that theſe glands, if there are ſuch under all the ſkin, ſhould be able to make ſo large ſecretions, appear not very probable to me, however I wiſh thoſe who have more leiſure and judgment than my ſelf, would examine this more nicely, becauſe ſo much theory of cutaneous diſeaſes depends upon it.

Membrana Adiposa, is all that membrane immediately under the ſkin, which contains the fat in cells; it is thickeſt on the Abdomen and buttocks, and thinneſt near the extremities; and where the muſcles adhere to the ſkin, and on the Penis, none. It contributes to keep the inner parts warm, and by filling the interſtices of the muſcles, renders the ſurface of the body ſmooth and beautiful, and may perhaps ſerve to lubricate their ſurfaces, and whether the decreaſe of fat which often follows labour or ſickneſs, proceeds from its being reaſſumed into the blood veſſels, or whether it is conſtantly perſpiring through the ſkin, and the leſſening of its quantity is from the want of a ſupply equal to its conſumption, is with me a matter of doubt, though the former opinion I know generally prevails.

MAMMÆ, the BREASTS, ſeem to be of the ſame ſtructure in both ſexes, but largeſt in women. Each breaſt is a conglomerate gland to ſeparate milk, ſeated in the Membrana Adipoſa, with its excretory ducts, (which are capable of very great diſtention,) tending toward the nipple, which as they approach, they unite, and make but a few ducts at their exit. There are to be met with in authors, inſtances ſufficiently atteſted of mens giving ſuck, when they have been excited by a vehement deſire of doing it: And it is a common obſervation, that milk will flow out of the breaſts of new-born children, both male and female.

CHAP. II.

Of the Membranes in general.

EVERY diſtinct part of the body is covered, and every cavity is lined with a ſingle membrane, whoſe thickneſs and ſtrength is as the bulk of the part it belongs to, and as the friction to which it is naturally expoſed.

Those membranes that contain diſtinct parts, keep the parts they contain together, and render their ſurfaces ſmooth, and leſs ſubject to be lacerated by the actions of the body. And thoſe which line cavities, ſerve to render the cavities ſmooth, and fit for the parts they contain to move againſt.

The membranes of all the cavities that contain ſolid parts, are ſtudded with glands, or are provided with veſſels, which ſeparate a Mucus to make the parts contained move glibly againſt one another, and not grow together. And thoſe cavities which are expoſed to the air, as the noſe, ears, mouth, and Trachea Arteria, have their membranes beſet with glands, which ſeparate matter to defend them from the outer air. Thoſe membranes that have proper names, and deſerve a particular deſcription, will be treated of in their proper places.

CHAP. III.

Of the ſalivary glands.

Parotis or Maxillaris Superior, is the largeſt of the ſalivary glands; it is ſituate behind the lower jaw, under the ear; its excretory duct paſſes over the upper part of the Maſſeter muſcle, and enters the mouth through the Buccinator. This gland has its Saliva promoted by the motions of the lower jaw. Its duct paſſes over the tendinous part of the Maſſeter muſcle that it may not be compreſſed by that muſcle, which would obſtruct the Saliva in it, though it is frequently ſaid that it paſſes over that muſcle that it may be compreſſed by it to promote the Saliva. In ſheep and calves, their jaws being long, this muſcle is inſerted far from the center of motion, that the end of the jaw may be moved with ſufficient ſtrength; and that diſtant inſertion requiring a greater length of muſcle, that its motion may be quick enough, no part of this muſcle could be allowed to be tendinous; therefore it ſeems, to avoid the inconvenience of compreſſion from the muſcle, the duct in thoſe animals goes quite round the lower end of it. When this duct is divided by an external wound, the Saliva will flow out on the cheek, unleſs a convenient perforation be made into the mouth, and then the external wound may be healed. I have ſeen two patients with this gland ulcerated, from which there was a conſtant effuſion of Saliva, 'till the greateſt part of the gland was conſumed with red mercury precipitate; and then it healed with little trouble. Hildanus mentions the ſame caſe, which for two years had been under the care of a ſurgeon without ſucceſs; and was at laſt cured by the application of an actual cautery.

MAXILLARIS INFERIOR, is ſituate between the lower jaw, and the tendon of the digaſtrick muſcle; its duct paſſes under the Muſculus Mylohyoideus, and enters the mouth under the tongue, near the Dentes Inciſorii. I was at the opening of a woman who was ſuffocated by a tumour which begun in this gland; it extended it ſelf from the Sternum to the parotid gland on one ſide in ſix weeks time, and in nine weeks killed her. It was a true Schirrus, and weighed twenty ſix ounces. In a man which I diſſected, I found a quanity of Pus near this gland, and a bundle of matter not unlike hair as large as a hen's egg.

SUBLINGUALIS, is a ſmall gland ſituated under the tongue, between the jaw and the Ceratagloſſus muſcle. In a calf I found ſeveral ducts of this gland filled by an injection into the duct of the ſubmaxillary gland; but Morgagni and others affirm that the ducts of this gland enter the mouth directly from the gland in ſeveral Places near the grinding teeth.

TONSILLA, is a globular gland about the bigneſs of a hazel-nut, ſituate upon the Pterygoideus Internus muſcle, between the root of the tongue and the Uvula. It has no duct continued from it, but empties all its ſmall ducts into a Sinus of its own, which Sinus, when the gland is inflamed, may eaſily be miſtaken for an ulcer. This gland with its fellow, direct the maſticated aliment into the Pharynx; and alſo ſerve for the Uvula to ſhut down upon when we breathe through the noſe. They are compreſſed by the tongue and the aliment, when the former raiſes the latter over its root, and thereby opportunely emit their Saliva to lubricate the food for its eaſier deſcent through the Pharynx. A ſchirrous tumour of either of theſe glands is a common diſeaſe, and it admits of no remedy but extirpapation; yet it muſt not be performed upon the whole gland, but ſo much of it as is become ſupernaturally eminent; becauſe that would be dangerous as well as difficult. The beſt way of extirpating theſe glands is, I think, by ligature: If the gland is ſmall at its baſis, the ligature may be tied round it; which I have eaſily performed by fixing the ligature to the end of a probe, which I bent, and ſo drew it round the gland, and tied it; about five days after this ligature growing looſe, I put on another in the ſame manner, and then in a few days the gland dropped off: but meeting with another caſe of this kind, where the baſis of the gland was too large to tie, I contrived an Inſtrument like a crooked needle ſet in a handle with an eye near the point; I thruſt this inſtrument, with a ligature in it through the bottom of the gland, and then taking hold of the ligature with a hook, I drew back the inſtrument; then drawing the double ligature forwards, I divided it, and tied one part above and the other below, in the ſame manner that I did to extirpate part of the Omentum in the cure of an Hernia: See the plate at the latter end of this book, and this ſucceeded as well as the former. I once ſaw them totally deſtroyed by venereal ulcers, and the Uvula, which was whole, having nothing to ſhut againſt, the patient ſnuffled almoſt as much as if the Uvula had been gone.

PRESSURE upon the ſurface of a gland very much promoting the ſecretion that is made in it, theſe glands are ſo ſeated as to be preſſed by the lower jaw, and its muſcles, which will be chiefly at the time when their fluid is wanted; and the force with which the jaw muſt be moved, being as the drineſs and hardneſs of the food maſticated, the ſecretion from the glands depending very much upon that force; it will alſo be in proportion to the drineſs and hardneſs of that food which is neceſſary; for all food, being to be reduced to a pulp, by being mixed with Saliva before it can be ſwallowed fit for digeſtion, the drier and harder foods needing more of this matter, will from this mechaniſm be ſupplied with more than moiſter foods in about that proportion in which they are drier and harder; and the drier foods needing more Saliva than moiſter, is the reaſon why we can eat leſs and digeſt leſs of theſe than thoſe. What quantity of Saliva theſe glands can ſeparate from the blood, in a given time, will be hard to determine, but in eating of dry bread it cannot be leſs than the weight of bread; and many men, in a little time, can eat more dry bread than twice the ſize of all theſe glands; and ſome men, that are not uſed to ſmoaking, can ſpit half a pint in the ſmoaking one pipe of tobacco; and ſome men in a ſalivation, have ſpit, for days or weeks together, a gallon in four and twenty hours; and, yet I believe, all theſe glands put together, do not weigh more than four ounces.

THE membrane which lines the mouth and palate, and covers the tongue, is every where beſet with ſmall glands, to afford Saliva in all parts of the mouth to keep it moiſt; for thoſe more remote are chiefly concerned in time of maſtication. Theſe ſmall glands have names given them according to their reſpective ſituation, as Buccales, Labiales, Linguales, Fauciales, Palatinæ, Gingivarum, and Uvulares.

A GLAND is chiefly compoſed of a convolution of one or more arteries of a conſiderable length, from whoſe ſides ariſe vaſt numbers of excretory ducts, as the lacteals ariſe from the guts, and for the ſame reaſon; for the paſſages into the excretory ducts of a gland, being ſuch as that only one ſort of fluid may paſs into them, the want of largeneſs is compenſated by their number; and in a great length of an artery, as in the guts thoſe proper fluids which eſcape one duct may paſs into another; and from what has been ſaid, it does not appear but that excretory ducts may ariſe from the veſſels that form membranes without being convolved at all. And this way I imagine ſecretions are made from all the membranes that line cavities, and ſome others. There alſo ariſe from theſe arteries lymphatic veſſels, whoſe uſe ſeems to be to take off the thinneſt part of the blood, where a thick fluid is to be ſecreted, ſeeing they are found in greateſt plenty in ſuch glands as ſeparate the thickeſt fluids, as in the teſticles and liver; and it is obſervable that where the thickeſt ſecretions are made, the velocity of the blood is the leaſt, as if it was contrived to give thoſe ſeemingly more tenacious parts more time to ſeparate from the blood. The arteries that compoſe different glands are convolved in different manners, but whether or no their different ſecretions depend upon that, I doubt will be difficult to diſcover. The excretory ducts ariſe from the arteries, and unite in their progreſs as the roots of trees do from the earth, and as different trees, plants, fruits, and even different minerals, in their growing, often derive their diſtinct proper juices from the ſame kind of earth; ſo the excretory ducts in different glands, ſeparate from the ſame blood their different juices: But what theſe different ſecretions depend upon, whether the ſtructure of the parts or different attractions, are what we have no certainty about, though this ſubject has employed ſeveral of the beſt writers. For my own part, from the great ſimplicity and uniformity uſually ſeen in nature's works, I am moſt inclined to think different ſecretions ariſe from different attractions, ſeeing that in plants and mineral there ſeems to be no other way.

CHAP. IV.

Of the Peritoneum, Omentum, Ductus Alimentalis and Meſentery.

PERITONEUM, is a membrane which lines the whole cavity of the Abdomen. It contains the liver, ſpleen, omentum, ſtomach, guts and meſentery, with all their veſſels and glands; the upper part of it is no other than the proper membrane of the diaphragm, and, but for compliance with cuſtom, there is no more reaſon for calling that, part of the Peritoneum, than there is for calling the membrane on the other ſide of the diaphragm part of the Pleura or Mediaſtinum. The fore part next the muſcles of the Abdomen, and their tendons may be divided into two Laminæ, yet I think anatomiſts in deſcribing the duplicature or Laminæ of the Peritoneum have not always meant this diviſion, but have taken the tendons of the tranſverſe muſcles for the outer Lamina, and conſidered the other as one membrane, ſeeing that it is between theſe tendons and the Peritoneum that the water is uſually found in that kind of dropſy which is called the dropſy in the duplicature of the Peritoneum. Upon the loins the inner ſurface only is ſmooth, and the outer part a ſort of looſe Membrana Adipoſa, in which are contained the Aorta, Vena Cava, Vaſa Spermatica, and Pancreas, with other parts of leſs note. The middle of the Peritoneum upon the loins is joined to the meſentery in ſuch a manner, as makes ſome account it a production of the Peritoneum, and ſome part of the external membrane of the Duodenum, becoming one membrane with the inner or ſmooth Lamina of the Peritoneum, and part of the Rectum is covered in the ſame manner; but the kidneys and bladder of urine are contained in a diſtinct duplicature of this membrane. The dropſy of the Peritoneum, may be diſtinguiſhed, by being leaſt prominent about the navel, for there the tendons and the Peritoneum will not ſeparate; and the water, in thoſe that I have diſſected, had made the parts where it was contained as foul as any ulcer; therefore none of them I preſume could have been cured by operation.

For the Umbilical veſſels, ſee chap. of the Fœtus. For the Proceſſus Vaginals, chap. of the parts of generation in men.

OMENTUM, or CAWL, is a fine membrane larded with fat, ſomewhat like net-work: It is ſituated on the ſurface of the ſmall guts, and reſembles an apron tuck'd up; its outer or upper part, named Ala Superior, is connected to the bottom of the ſtomach, the ſpleen, and part of the Inteſtinum Duodenum; and thence deſcending a little lower than the navel, is reflected and tyed to the Inteſtinum Colon, the ſpleen, and part of the Duodenum: This laſt part is called Ala Inferior; and the ſpace between the Alæ is is named Burſa. This cavity is very diſtinct in moſt brutes, but ſeldom ſo in men. Sometimes both Alæ are tied to the liver, and, in diſeaſed bodies, to the Peritoneum. Its uſe is, to lubricate the guts, that they may the better perform their periſtaltick motion. Malpighi deſcribes adipoſe ducts in this membrane to carry the fat from the cells into the Vena Portarum, and thinks it a neceſſary ingredient in the bile. In dropſies of the Abdomen, and in perſons who from any other cauſe have died tabid, it is generally rotten and decayed; and ſometimes the guts in theſe caſes adhere to one another: But whether theſe adheſions proceed from the Omentum's ceaſing to perform its office, or from the periſtaltick motion of the guts, being long diſcontinued through abſtinence, or both, I cannot determine. I have ſeen one inſtance, from diſſection, of a very large rupture of the Omentum, or Epiploon, into the groin, together with one of the guts; the rupture of the Omentum, is called by authors Epiplocele.

DUCTUS ALIMENTALIS, is the Œſophagus, ſtomach and guts, viz. Duodenum, Jejunum, Ileum, Colon, Cæcum or Apendicula Vermiformis, and Rectum.

ŒSOPHAGUS or gullet, is the beginning of the alimentary duct; its upper part is wide and open ſpread behind the tongue to receive the maſticated aliment; it begins from the baſis of the ſcull near the Proceſſus Pterygoides of the ſphenoidal bone, then deſcending becomes round, and is called Vaginalis Gulæ; it runs from the tongue cloſe to the ſpine, under the left Subclavian blood veſſels, into and through the Thorax on the left ſide, then piercing the diaphragm, it immediately enters the ſtomach. It is compoſed of a thin outer coat, which is no more than a proper membrane to the middle or muſcular coat. The middle coat is compoſed of longitudinal and circular muſcular fibres, but chiefly circular, abundantly thicker than the ſame coat in the guts; becauſe this has no foreign power to aſſiſt it, as the guts have, and becauſe it is neceſſary the food ſhould make a ſhorter ſtay here than there. The inner coat, is a pretty ſmooth membrane, beſet with many glands, which ſecrete a mucilaginous matter, to defend this membrane, and render the deſcent of the aliment eaſy.

Tab. xiv. 6. VENTRICULUS, the ſtomach, is ſituated under the left ſide of the diaphragm, its left ſide touching the ſpleen, and its right is covered by the thin edge of the liver; its figure nearly reſembles the pouch of a bag-pipe, its left end being moſt capacious, the upper ſide concave and the lower convex; it has two orifices, both on its upper part; the left (through which the aliment paſſes into the ſtomach) is named Cardia; and the right (through which it is conveyed out of the ſtomach into the Duodenum) is named Pylorus; where there is a circular valve which hinders a return of aliment out of the gut, but does not wholly hinder the gall from flowing into the ſtomach.

THE coats of the ſtomach are but three; the external membranous, the middle muſcular, whoſe fibres are chiefly longitudinal and circular, the inner membranous, and beſet with glands, which ſeparate a Mucus. This laſt coat is again divided by anatomiſts into a fourth, which they call Villoſa. As the muſcular coat of the ſtomach contracts, the inner coat falls into folds, which increaſe as the ſtomach leſſens, and conſequently retard the aliment moſt when the ſtomach is neareſt being empty.

THE manner in which digeſtion is performed has been matter of great controverſy. The ancients generally ſuppoſed the food concocted by a fermentation in the ſtomach: But the moderns more generally attribute it to the muſcular force of the ſtomach; which Dr. Pitcairne has computed to be equal to a hundred and ſeventeen thouſand and eighty eight pound weight, to which being added the abſolute force of the diaphragm and abdominal muſcles; (but for what reaſon I am at a loſs to conceive, when ſo ſmall a part of that force can be exerted this way) the ſum then will be more than twice as much; a force indeed equal to the end for which he aſſigns it. Now this force of the muſcular coat of the ſtomach is near forty times greater than what Borelli has aſſigned to the heart, which is much ſtronger; and Dr. Keil has undertook to prove, that the force which the heart exerts is not thrice as many ounces as Borelli computes it to be thouſand pounds weight. And this is as certain as that action and reaction are the ſame; that the abdominal muſcles and the diaphragm, compreſs the ſtomach with no greater force than they do the liver and all other parts contained in the Abdomen; and that the Fœtus in Utero, and all the Viſcera in the Abdomen, receive much more of this force, during the time of geſtation; and yet neither the Fœtus, nor any other contained part, is digeſted by that force; and for the force with which the ſtomach it ſelf acts, it will be juſt the ſame with the reaction of the food upon it, and therefore ſhould be as much more liable to be digeſted by this and the other force than the food, as it oftner feels theſe forces than that, (only that living bodies are not ſo liable to digeſtion as dead ones): Beſides, I think it may be demonſtrated, that the force with which the ſtomach compreſſes any part of its contents, is not greater than what is given to equal parts of the contents in the ſmall guts;

for if the moment of a muſcle is as its weight, and and if the muſcular coat of the ſtomach does not bear a greater proportion to the muſcular coat of a ſmall gut, than their diameters bear; a ſection of the ſtomach, having ſo many more equal parts to preſs than a like ſection of a gut; it will require juſt ſo much more force to give each part the ſame preſſure. Dr. Drake has ſuppoſed, that digeſtion is performed in the ſtomach, as in Papin's digeſter, in which hypotheſis are contained all the abſurdities of that of Pitcairne's, with this addition, that the ſtomach muſt be as irreſiſtible to diſtention at that time, as his iron pot, and the orifices as forcibly ſecured; but then indeed it ſhews how bits of bones, which dogs ſwallow may be retained in the ſtomach without tearing it; which difficulty, in my opinion, Dr. Pitcairne has not ſufficiently accounted for, though it is none of the leaſt in his hypotheſis. In granivorous birds, where digeſtion is made by muſcular force, their ſecond ſtomach is plainly contrived for comminuting or digeſting their food that way; for beſides that it is one of the ſtrongeſt muſcles in their bodies, its inſide is defended with a hard and ſtrong membrane that it may not be torn; and theſe birds always eat with their grain the rougheſt and hardeſt little ſtones they can find, which are neceſſary for grinding their food, notwithſtanding it is firſt ſoaked in another ſtomach, and is alſo food of very eaſie digeſtion. In ſnakes, ſome birds, and ſeveral kinds of fiſh, which ſwallow whole animals, and retain them long in their ſtomachs, digeſtion ſeems to be performed by a Menſtruum; for we frequently find in their ſtomachs animals ſo totally digeſted, before their form is deſtroyed, that their very bones are made ſoft. In horſes and oxen, digeſtion is but little more than extracting a tincture; for in their excrements, when voided, we ſee the texture of their food is not totally deſtroyed, though graſs in particular ſeems to be of as eaſy digeſtion as any food whatever, and the corn they eat is often voided entire; and in the excrements of men, are often ſeen the ſkins of fruits undigeſted, and ſmall fruits, ſuch as currants, unbroke, and worms alſo continue unhurt, both in the ſtomach and guts. Therefore by comparing our ſtomachs with thoſe here mentioned, it appears to me that our digeſtion is performed by a Menſtruum which is chiefly Saliva, aſſiſted by the action of the ſtomach, and the abdominal muſcles, and by that principle of corruption which is in all dead bodies. For digeſtion is no other than corruption of our food, and therefore quantities of hot ſpirits, which hinder the corruption of animal bodies, alſo hinder digeſtion.

DUODENUM, is the firſt of the three ſmall guts; it begins from the Pylorus of the ſtomach, and is thence reflected downward; it firſt paſſes by the gall-bladder, and then under the following gut and meſentery, and coming in ſight again in the left Hypochondrium, it there commences Jejunum, which is the ſecond of the ſmall guts; but the place where this ends and the other begins, is not preciſely determined.

Tab. xiv. 7. JEJUNUM, is ſo called from its being found for the moſt part empty; it is ſituated in the Regio Umbilicalis, and makes ſomewhat more than a third part of the ſmall guts. It is diſtinguiſhed from the following gut by its coats, which are a ſmall matter thinner, and leſs pale.

Tab. xiv. 7. ILEUM, is the continuation of the former, ſituated in the Hypogaſtrium, and very often ſome part of it in the Pelvis of the Abdomen, upon the bladder of urine, eſpecially in women; it enters the Colon on the right ſide, near the upper edge of the Os Ilium. This great length of the ſmall guts is evidently for the convenience of a greater number of lacteals, that the chyle which miſſes their orifices in one place may not eſcape them in another. But thoſe animals which ſwallow their food whole, and have it a long time in their ſtomachs and guts, have ſhorter guts and fewer lacteals.

COLON, is the firſt of the great guts; it begins at the upper edge of the right Os Ilium; thence aſcending paſſes under ſome part of the liver, and the bottom of the ſtomach, from the right Hypochondrium to the left, and thence deſcends to the Pelvis Abdominis.

CÆCUM, or Appendicula Vermiformis, is ſituated on the beginning of the Colon; it is leſs than an earth-worm, with a ſmall orifice opening into the Colon. This gut has ſeldom any thing in it. In men it is called one of the large guts, though it is the ſmalleſt by far; but the miſtake ariſes from copying the ancients, whoſe deſcriptions of all the parts contained in the Abdomen ſeem to be taken from dogs, for in them and in many other animals, it is very large: And ſome fiſh have them in great numbers, but very ſmall; I have counted in a mackarell above 150.

RECTUM, is the continuation of the Colon through the Pelvis to the Anus.

THE guts have the ſame coats with the ſtomach; the fibres of their middle or muſcular coat, are circular, or ſpiral, and longitudinal; of the latter but very few. The antagoniſts to theſe muſcular fibres of the ſtomach and guts, are their contents preſſed from one place to another, and the muſcles of the Abdomen, for theſe preſſing upon them alter their form into one leſs capacious; which neceſſarily extends their circular fibres. The great guts have three membranes, or ligaments, on the outſide running their whole lengths, and ſupporting the Saculi, into which thoſe guts are divided. The leſſer guts, have at very ſmall diſtances ſemilunar valves placed oppoſite to the interſtices of each other; they prevent the aliment from paſſing too ſpeedily through the guts; and the better to anſwer that end, they are larger and more numerous near the ſtomach, where the food is thinner, than they are towards the Colon, where the food is continually made thicker in its progreſs, by a diſcharge of part of the chyle. But brutes have them not, becauſe they are not neceſſary to an horizontal poſture. At the entrance of the Ileum into the Colon, are two very large valves, which effectually hinder the regreſs of the Fæces into the Ileum. But clyſters have been frequently known to paſs them, and be vomited up; but the excrement that is ſometimes vomited up, I am inclined to think, is ſuch as had not paſſed into the great guts: The other valves in the Colon, are placed oppoſite (but not in the ſame plane) to each other, and make with their anterior edges an equilateral triangle; but as the gut approaches the Anus, they become leſs remarkable, and fewer in number.

ALL the guts have in their inner membrane an almoſt infinite number of very ſmall glands: Theſe glands will, ſome of them eſpecially in the large guts appear to the naked eye when they are diſeaſed: They are called Glandulæ Pyerianæ.

THE length of the guts to that of the body is as five to one in a middle-ſized man; in taller men, the proportion is uſually leſs, and in ſhort men greater.

THE following caſe I had thus related (in preſence of a great many gentlemen who had ſeen the caſe) from Mr. Punt of Cambridge, a gentleman, when living, well known for his great ſkill in Surgery.

"I was called to a poor woman, a few years
" ſince with a mortification upon the Abdomen.
" I cut away the mortified part, and found ſome
" of the ſmall guts mortified. I cut off ſo much
" of them as could not be ſaved, and ſtitched
" the ſound part of the gut, to a ſound part of
" the wound, near the navel; to which it after-
" ward adhered, and ſhe recovered and voided
" her excrement that way, without any notable
" inconvenience; and at every ſtool part of the

" gut would thruſt out, without any pain, like a " Prolapſus Ani: But about a year after the cure, " ſhe died of the ſtone." I do not remember that he told me what cauſed this mortification, but my honoured friend Martin Folks, Eſq; who lets nothing curious ſcape his obſervation, and was at that time of Clare-Hall in Cambridge, has informed me, " That the mortification was made by " laying hot bricks to her belly, for the cholick, " ſome of which burnt her, and when the ſlough " caſt off a gut appearing, a female ſurgeon took " it for a bliſter and clipped it, upon which the " excrement came out of the wound, and then " they ſent for Mr. Punt.

THE following caſe, was of a patient to Mr. Walter, a Surgeon, at Lewis in Suſſex, whom I have heard relate it; but for this account, as well as the cut, I am obliged to my ingenious friend Dr. Ruſſel, who ſaw the caſe; but I cannot be of Mr. Walter's opinion, that it was the Colon that was mortified.

SIR,

" MRs. Stoneſtreet of Lewis in Suſſex, " had the Exomphalos above twenty " years, before it was attended with the following " accident. In the year 1700, the twenty eighth " of May, ſhe was taken with a cholick, and a " total ſuppreſſion of ſtools; the inteſtine morti- " fied, and part of it was taken off by Mr. Wal- " ter a Surgeon, who gave me an account of the " caſe, and aſſured me it was the Colon; the " other part was thruſt out daily by the periſtal-

" tick motion of the guts, when the excrements
" were voided, till it adhered to the wound;
" and had the juſt appearance of what is expreſſ-
" ed in the picture I ſent you. I had a perfect
" examination of it in her life-time, but no op-
" portunity of opening her after death; the
" ſides of the inteſtine firmly adhered to the bel-
" ly, and the part which hung out, looked like
" a pale ſcarlet ſtrawberry, that had not its full
" ripeneſs; and the coats of it were extremely
" thickened. She lived in this condition twelve
" years, and died of a fever, with ſcorbutick
" ſwellings in her legs.

I am Sir, &c.

RICRARD RUSSEL.

Tab.xxiv. THE following caſe happened in my own practice: Margaret White, the wife of John White, a penſioner in the fiſhmongers alms-houſes, at Newington in Surry, in the fiftieth year of her age had a rupture at her navel, which continued till her ſeventy third year, when after a fit of the cholick it mortified, and ſhe being preſently after taken with a vomiting, it burſt. I went to her and found her in this condition, with about ſix and twenty inches and an half of the gut hanging out mortified. I took away what was mortified, and left the end of the ſound gut hanging out at the navel, to which it afterwards adhered, and ſhe recovered. It is now three years ſince this accident happened, and ſhe continues perfectly well, voiding the excrements through the

Inteſtine at the navel, and though the ulcer was ſo large after the mortification ſeparated, that the breadth of two guts was ſeen; yet they never at any time protruded out at the wound, though ſhe was taken out of her bed and ſat up every day.

But for a caſe nothing inferior to any of theſe, I am obliged to a farrier, or doctor for cattle, as he ſtyles himſelf: The truth of this caſe is known to numbers of perſons; as Mr. Hunt, a gentleman of unqueſtionable veracity has informed me, before whom the following account was given upon oath.

" Thomas Brayn of Yeaton, in the pa-
" riſh of Baſchurch, and county of Salop,
" a doctor for cattle, maketh oath, that about
" ten or twelve years agone, he was ſent for by
" a farmer or huſbandman, who lived near the
" village called Maeſbrooks, and very near to
" the river Verney, in the ſaid county of Salop,
" to have his advice about an ox he had, which
" was there ſick by reaſon he could not dung;
" he had been drenched by ſeveral beaſt-doctors,
" before this deponent came to him. This de-
" ponent ſeeing this ox in the condition he was in,
" told the owner, that if he would venture his
" ox, he would do him what ſervice he could,
" in the curing of him; which the owner con-
" ſented to, and thereupon this deponent opened
" the ox in the flank, and took out great part
" of his bowels, upon ſearching which he found
" there was a perfect ſtoppage in the guts; and

“ the gut was about the ſtoppage putrified for a-
“ bout three quarters of a yard, whereupon this
“ deponent cut off ſo much of the gut as was
“ putrified, and took it quite away, and then
“ drew the ends of the guts which remained
“ ſound after what was cut off, together upon a
“ hollow keck, which was about three or four
“ inches long, and ſewed the ſaid ends of the
“ guts together upon the ſaid keck, leaving the
“ keck within the guts; and then ſewed up the
“ hole cut in the hide upon the flank of the ſaid
“ ox; and this deponent further ſaith, that with-
“ in the ſpace of one hour after this operation was
“ performed, the ox dunged; and the piece of
“ the keck which the ſaid ends of the gut were
“ ſewn upon and left within the guts, came away
“ from the ox with the dung, whereupon the ox
“ recovered and lived to do the owner ſervice ſe-
“ veral years.

Jurat' decimo ſeptimo die Julii, anno Dom. 1716. coram Tho. Hunt.	The mark of = Thomas Brayn.

MESENTERY, is a membrane beginning looſely upon the loins, and is thence produced to all the guts: It preſerves the Jejunum and Ileum from twiſting in their periſtaltick or vermicular motion, and confines the reſt to their places. It ſuſtains all the veſſels going to and from the guts, viz. arteries, veins, lymphæducts, lacteals and nerves, and alſo contains many glands, called from their ſituation Meſentericæ. The beginning of this membrane from the loins, is about three or four inches broad, but next the guts of the ſame length with the ſide of the guts they adhere to, which is in the ſmall guts about a fourth part ſhorter than the other ſide; but when this membrane is ſeparated from the ſmall guts, it ſhrinks, and meaſures about two thirds leſs.

I OPENED a boy about twelve years old, that died of the iliac paſſion; the guts, ſtomach, Duodenum and Jejunum were diſtended, with vapour and air, to near ten times their natural capacity, which ſo compreſſed the Inteſtinum Ileum, that nothing could paſs through it. The relations of this boy could give no other account of the cauſe of this diſeaſe, than that of his having eaten a large quantity of raw young carrots. This caſe happens very frequently to lambs that have been houſed, and turned out early in the ſpring to graſs, when the graſs is very rank and ſucculent; and alſo to horſes, oxen and ſheep, when they happen to feed by any accident, upon young beans or peas, or rich clover graſs, which are full of air, and very apt to ferment and expand in their ſtomachs: In theſe animals this caſe is commonly cured by running a knife into their guts, ſome inſtances of which I have ſeen, and have heard a great many reported; but this caſe happening very rarely to men, and being to be cured ſometimes by the ſwallowing of crude mercury, I believe that practice has never yet been uſed; though the inſtrument which is uſed for tapping in a dropſy of the Abdomen, would do it with great eaſe and ſafety. Some anatomiſts, who have conſidered the impoſſibility of a twiſting of the guts, (which is the vulgar name of this diſeaſe) have imagined that it proceeded from one gut being involved in another; but theſe involutions, are found in moſt bodies that die a natural death, and without any inflammation, or any other ſymptom of pain.

CHAP. V.

Of the liver, gall-bladder, pancreas and ſpleen.

Tab. xiv. xv. 4. THE LIVER, is the largeſt gland in the body, of a duſky red colour. It is ſituated immediately under the diaphragm in the right Hypochondrium; its exterior ſide is convex, and interior concave; backward toward the ribs it is thick, and thin on its forepart, where it covers the upper ſide of the ſtomach, and ſome of the guts; the upper ſide of it adheres to the diaphragm, and is alſo tyed to it and the Sternum by a thin ligament, which is deſcribed commonly as two; the upper part called Suſpenſorium, and the anterior Latum; but either of theſe names is ſufficient for it all: It is alſo tied to the navel by a round ligament called Teres or Umbilicale, which is the umbilical vein degenerated into a ligament; it is inſerted into the liver at a ſmall

fiſſure in its lower edge. The Ligamentum Latum or Suſpenſorium, ſuſtains the liver in an erect poſture, or rather fixes it in its ſituation, while it is ſupported by the other Viſcera, they being compreſſed by the abdominal muſcles; in lying down, the Teres prevents it from preſſing on the diaphragm; and in lying on the back, they both together ſuſpend it, that it may not compreſs and obſtruct the aſcending Vena Cava. I ſuppoſe it is nouriſhed by the branches of the celiac and and meſenteric arteries in the liver called Arteriæ Hepaticæ; but its blood-veſſels, that compoſe it as a gland, are the branches of the Vena Portæ, which enters the liver, and diſtributes its blood like an artery, to have the bile ſecreted from it, (Vid. Vena Portæ) and the Tab. xix.
branches of the Cava in the liver, which return the redundant blood into the Cava Aſcendens. It has alſo ſeveral branches of nerves, and a great Tab. xx.
number of lymphaticks: Of which I ſhall treat 7, 8.
in their reſpective places. Dogs and cats and other animals, that have a great deal of motion in their backs, have their livers divided into many diſtinct lobules; which by moving one upon another, comply with thoſe motions, which elſe would break their livers to pieces.

The gall-bladder, is a receptacle of bile, ſeated in the hollow-ſide of the liver; it is com- Tab. xv.
poſed of one denſe coat ſomewhat muſcular, which 13. xx. 3.
is covered with a membrane like that of the liver; and is alſo lined with another, that cannot eaſily be ſeparated.

MODERN anatomiſts have deſcribed a number of ſmall ducts leading from the liver to the gall-bladder, by which they ſuppoſe the gall-bladder is filled, and theſe I thought I had ſeen in a human body that died of a jaundice, when I was a very young anatomiſt; but never being able to ſee any ſince in any animal, though I have made very diligent enquiry by experiments and diſſection, I begin now to be perſuaded that there are no ſuch ducts; for if they are too little to be ſeen or filled by injections, I think they are much too little for the end for which they are aſſigned. As to the argument for the exiſtence of ſuch ducts, which is fetched from the difficulty of the gall-bladder's being filled through the Ductus Cyſticus from the Ductus Hepaticus, I think it is of no weight, becauſe the Veſiculæ Seminales, we know, are filled with a thicker fluid through a leſs direct paſſage. From the gall-bladder towards
Tab.xx.4. the Duodenum, runs a duct called Cyſticus; and
Tab.xx.1. from the liver to this duct, one called Hepaticus, which carries off the gall this way, when the gall-
Tab.xx.5. bladder is full; then the ductus Cyſticus and Hepaticus being united, commence Ductus Communis Choledochus, which enters the Duodenum obliquely about four inches below its beginning. The orifice of this duct in the gut is ſomewhat eminent, but has no caruncle, as is commonly ſaid. As the liver from its ſituation in the ſame cavity with the ſtomach, will be moſt preſſed and conſequently ſeparate moſt gall when the ſtomach is fulleſt, which is the time when it is moſt wanted; ſo the gall-bladder, being ſeated againſt the Duo-

Duodenum, will have its fluid preſſed out by the aliment paſſing through that gut, and conſequently at a right time, and in due proportion; becauſe the greater that quantity of aliment is, the greater will be the compreſſion; and ſo the contrary.

Tab.xv.6. PANCREAS, the ſweet-bread, is a large gland of the ſalivary kind, lying a-croſs the upper and back-part of the Abdomen, near the Duodenum. It is what the antients called a conglomerate gland, appearing ſo without diſſection to the naked eye; it has a ſhort excretory duct, about half as large as a crow-quill, though it is commonly painted as large as the Ductus Communis Choledochus: It always enters the Duodenum together with the bile duct; but in dogs ſome diſtance from it; and, I think, always in two ducts diſtant from one another. The juice of this gland, together with the bile, ſerves to complete the digeſtion of the aliment, and render it fit to enter the lacteal veſſels.

Tab. xv. D. THE ſpleen, is ſeated in the left Hypochondrium, immediately under the diaphragm, and above the kidney, between the ſtomach and the ribs; it is ſupported by the ſub-contained parts, and fixed to its place by an adheſion to the Peritoneum and diaphragm; it is alſo connected to the Omentum, as has been obſerved. The figure of it is a ſort of depreſſed oval, near twice as long as broad, and almoſt twice as broad as thick: Sometimes it is divided into lobules, but for the moſt part, has only one or two ſmall fiſſures on its edge, and ſometimes none. In its colour it reſembles caſt-iron. The inner texture in brutes is veſicular, like the Penis; in which veſicles are found grumous blood, and ſmall bodies, like glands: But Ruyſch denies that the human ſpleen is of the ſame texture.

I KNOW no way of computing with any exactneſs, the quantity of bile that is uſually ſecreted by the liver in a given time; but if it is four times as much as all the ſalivary glands ſecrete, it may be twenty four ounces for every meal; to which being added ſix ounces of Saliva, which, from what I have obſerved in the chapter of the ſalivary glands, I think will appear a moderate computation. And ſuppoſing the Pancreas in the ſame time ſecretes three ounces, there will then be thirty three ounces of fluids ſeparated for the digeſtion of one meal; and that theſe neceſſary fluids may not be waſted in ſuch quantities, they paſs into the blood with the chyle, and may be ſoon ſeparated again for the ſame uſe; and very likely, ſome of the ſame bile may be employed more than once, for digeſting part of the ſame meal: And as the liver exceeds all the glands in the body in magnitude, and its excretory ducts ending in the Duodenum, it ſeems to me to be much more capable of making thoſe large ſeparations from the blood, which are procured by catharticks, than the ſcarce viſible glands of the guts.

THE liver, ordinarily weighs, in a middle-ſized man, about three pounds twelve ounces, the Pancreas three ounces, and the ſpleen fourteen ounces. The ſpleen I have taken out of a

dog,

dog, without any remarkable inconvenience to him. And I have twice, in a humane body, ſeen three ſpleens, twice two, and once four; ſome of theſe were very ſmall, others nearly equal, but all together in any of theſe bodies, were not greater than the one which is uſually found. I have ſeen a diſeaſed liver in a man, that weighed fourteen pounds four ounces; and in a boy but nine years old, that died hydropick, I found the liver full of hydatids, and cyſts of hydatids adhering to it, which together weighed ſeven pounds, one ounce and a half, though ſeveral pints of water had been let out of it before. The ſpleen, in the ſame boy, together with the hydatids contained in its membrane, weighed three pounds: In a man I found a diſeaſed ſpleen, weighing five pounds two ounces; and in an old man ſix foot high, I found a ſound liver, weighing no more than twenty eight ounces, and the ſpleen but ten ounces: And in a man that was cured of a dropſy, I found a Polypus very ſolid, almoſt filling the large branches of the Porta in the liver, and a ſtone between the liver and gall bladder, larger than a nutmeg; and in a man that died of a jaundice, I found the Ductus Communis Choledocus, conſtricted by a ſcirrhous Pancreas, the gall-bladder extended to the ſize of a gooſe-egg, and all the ducts to twice their natural bigneſs. This is the caſe in which I thought I had ſo plainly ſeen the cyſtyhepatick ducts; I once ſaw the Ductus Cyſticus obſtructed without the gall-bladder, being diſtended ſo much as is uſual, which, I think, furniſhes us with a very probable argument againſt the exiſtence of cyſtyhepatick ducts.

CHAP. VI.

Of the Vaſa Lactea.

VASA LACTEA, are the Venæ Lacteæ, Receptaculum Chyli, and Ductus Thoracicus.

VENÆ LACTEÆ, &c. are a vaſt number of very fine pellucid tubes, beginning from the ſmall guts, and proceeding thence through the meſentery; they frequently unite, and form fewer and larger veſſels, which firſt paſs through the meſenterick glands, and then into the Receptaculum Chyli: Theſe veſſels e'er they arrive at the meſenterick glands, (or in dogs the Pancreas Aſſellii, which is theſe glands collected) are called Venæ Lacteæ Primi Generis; and thence to their entrance into the Receptaculum Chyli, Venæ Lacteæ Secundi Generis. The office of theſe veins, is to receive the fluid part of the digeſted aliment, which is called chyle, and convey it to the Receptaculum Chyli, that it may be thence carryed through the Ductus Thoracicus into the blood-veſſels.

FOR the following excellent deſcription (thus marked") of the Receptaculum Chyli, and Ductus Thoracicus, I am obliged to Mr. Monro.

" RECEPTACULUM CHYLI, Pecqueti, or
" Saccus Lacteus, Van Horne, is a membranous ſomewhat

“ what pyriform bag, two thirds of an inch long, one third of an inch over in its largeſt part, when collapſed; ſituated on the firſt Vertebra Lumborum, to the right of the Aorta, a little higher than the Arteria Emulgens Dextra, under the right inferior muſcle of the diaphragm; it is formed by the union of three tubes, one from under the Aorta, the ſecond from the interſtice of the Aorta and Cava, the third from under the emulgents of the right ſide. The Saccus Chyliferus at its ſuperior part becoming gradually ſmaller is contracted into a ſlender membranous pipe of about a line diameter, well known by the name of

“ DUCTUS THORACICUS, this paſſes betwixt the Appendices Muſculoſæ Diaphragmatis, on the right of, and ſomewhat behind the Aorta, then lodged in the cellular ſubſtance under the Pleura, it mounts between this artery and Vena Sine Pari, or Azygos, as far as the fifth Vertebra Thoracis, where it is hid by the Azygos, as this vein riſes forward to join the Cava Deſcendens, after which the duct paſſes obliquely over to the left ſide under the Œſophagus, Aorta Deſcendens, and great curvature of the Aorta, until it reaches the left carotide, ſtretching farther towards the left internal jugular, by a circular turn, whoſe convex is upmoſt; at the top of this arch it ſplits into two for one half line, the ſuperior branch receiving into it a large lymphatick from the cervical glands. This lymphatick appears by blowing and injections to have no valves; when "the two branches are united, the duct continues "its courſe to the internal jugular, behind which "it deſcends, and immediately at the left ſide of "the inſertion of this vein, enters the ſuperior "and and poſterior part of the left ſubclavian, "whoſe internal membrane duplicated forms a ſemilunar externally convex valve that covers two "thirds of the orifice of the duct; immediately "below this orifice a cervical vein from the Muſculi Scaleni enters the ſubclavian. The thin "coat and valves, commonly ten or twelve, of "this duct are ſo generally known, I need not "mention them. In my notes I find little variation in the Receptaculum, only its different "capacities in different ſubjects, and ſometimes "more ducts concurring in the formation of "it.

"THE diameter of the duct varies in moſt "bodies, and in the ſame ſubject is uniform, but "frequently ſudden enlargements or Sacculi of it "are obſervable. The diviſions which authors "mention of this duct within the Thorax are very "uncertain: In a woman I diſſected laſt ſummer, "at the eighth Vertebra Thoracis, one branch "climbed over the Aorta, and about the fifth "Vertebra ſlipped back again under that artery "to the other branch, which continued in the "ordinary courſe. Laſt winter I found this duct "of a man diſcharging it ſelf entirely into the "right ſubclavian vein.

"THE preciſe Vertebra where it begins to "turn towards the left is alſo uncertain. Frequently it does not ſplit at its ſuperior arch, "in which caſe a large Saccus is found near its "aperture into the ſubclavian vein.

"GENERALLY it has but one orifice, "though I have ſeen two in one body, and three "in another; nay, ſometimes it divides into two "under the curvature of the great artery, one "goes to the right, another to the left ſubclavi- "an; this however is very rare. The lympha- "tick, which enters the ſuperior arch, is often "ſent from the thyroide gland."

SUPPOSING there ordinarily paſſes five pounds of chyle in a day through the lacteals, and that four ounces of this only is added to the blood, (though it may be any other quantity for ought I know) and that a man neither decreaſes nor encreaſes during this time, then all the ſeparations from the fluids and ſolids muſt be juſt five pounds; four ounces of which muſt be thoſe fluids and particles of ſolids, which are become unprofitable; and the remaining four pounds twelve ounces, will ſerve as a vehicle to carry the four ounces off: So that we ſee for what reaſon more fluids are carried into the blood than are to be retained there, and how the body is by the ſame means both nouriſhed and preſerved in health.

THE chyle is diluted in its paſſage by the lymph. Vid. chap. of the Lymphaticks.

CHAP. VII.

Of the Pleura, Mediaſtinum, Lungs, Pericardium, and Heart.

PLEURA is a fine membrane which lines the whole cavity of the Thorax, except on the diaphragm, which is covered with no other than its own proper membrane; the back part of it is extended over the great veſſels, like the Peritoneum; and in regard this membrane paſſes partly under theſe veſſels, as the Peritoneum does in the Abdomen, they may be ſaid to lie in a duplicature of it; it ſerves to make the inſide of the Thorax ſmooth and equal.

MEDIASTINUM, (if we may deſcribe ſuch a membrane in the humane body) divides the Thorax lengthways, from the Sternum to the Pericardium and Pleura, which is a very ſhort ſpace, but in many brutes very conſiderable. It divides into two in men, but in brutes it is ſingle; it divides the Thorax not exactly in the middle, but towards the left ſide, and is ſo diſpoſed, that the two cavities, into which it divides the Thorax, do not end toward this membrane in an angle, but a ſegment of a circle; it hinders one lobe of the lungs from incommoding the other, as in lying on one ſide the uppermoſt would frequently do; and prevents the diſorders of one lobe of the lungs from affecting the other.

THE lungs, are compoſed of two lobes, one Tab. xiv. 2. ſeated on each ſide of the Mediaſtinum, each of which lobes are ſub-divided into two or three lobules, which are moſt diſtinctly divided in ſuch animals as have moſt motion in their backs, for the ſame end that the liver is in the ſame animals; they are each compoſed of very ſmall cells, which are the extremities of the Aſpera Arteria or Bronchos. The figure of theſe cells is irregular; yet they are fitted to each other, ſo as to have common ſides, and leave no void ſpace. Dr. Willis has given a very particular deſcription of the inner texture of the lungs, but it is wholly imaginary and falſe, as he, and they who have copied his cuts and deſcriptions could not but have known, if they had ever made the leaſt enquiry into the lungs of any animal; nor is his account of the lymphaticks on the ſurface of the lungs, at all more true than that of their texture. In the membranes of theſe cells are diſtributed the branches of the pulmonary artery and vein. The known uſes of the air's entering the lungs, are to be inſtrumental in ſpeech, and to convey Effluvia into the noſe, as it paſſes, for the ſenſe of ſmelling; but the great uſe of it by which life is preſerved, I think, we do not underſtand. By ſome the force of the air is thought to ſeparate the Globuli of the blood, that have cohered in the ſlow circulation through the veins; and this opinion ſeems to be favoured by the many inſtances of Polypuſſes (which are large concretions of the Globuli of the blood) found in the veins near the heart, and in the right auricle and ventricle of the heart, and their being ſo ſeldom found in the pulmonary veins, or in the left auricle or ventricle of the heart, or in any of the arteries; but if it is true that, while the blood paſſes through the lungs, many cohering Globuli are ſeparated, yet it remains to be proved that theſe ſeparations are made by the force of the air. Dr. Keil has computed the force of the air in the ſtrongeſt expirations againſt the ſides of all the veſicles, to be equal to fifty thouſand pound weight, yet if we conſider we ſhall ſtill find the moment of the air in the lungs exceeding ſmall in any ſmall ſpace. For the velocity with which the air moves in the lungs, is as much leſs than that with which it moves in the wind-pipe, as the ſquare of a ſection of the cells in the lungs is greater than the ſquare of a ſection of the wind-pipe; and therefore if the ſquare of all the extreme blood-veſſels in the lungs, do not bear a greater proportion to the ſquare of the large pulmonary veſſels than the ſquare of the cells do to the wind-pipe, and if the blood in theſe large veſſels moves as faſt as the air in the wind-pipe; (all which I think may be granted) then the blood moving in the ſmalleſt veſſels of the lungs with a velocity equal to that of the air in the cells, the blood will have as much more preſſure from the power that moves it in its own veſſels than the air can give upon them, as blood is heavier than air. Beſides, air preſſing equally to all ſides, and the Globuli of the blood ſwimming in a fluid; this preſſure, be it what it will, I think, can be of little uſe to make ſuch ſeparations. Indeed it may be objected that the greateſt preſſure is in expiration, yet that ſurely cannot be much greater, while the air has ſo free a paſſage out of them. Others have thought that the air enters the blood-veſſels from the cells in the lungs, and mixes with the blood; but this opinion, however probable, wants ſufficient experiments to prove it; air being found in the blood, as there certainly is, is no proof of its entering this way, becauſe it may enter with the chyle: Nor is the impoſſibility which has been urged of its entering at the lungs without the blood being liable to come out the ſame way into the veſicles of the lungs, a good argument to the contrary; for if a pliable duct paſſes between the membranes of a veſſel, through a ſpace greater than the ſquare of its orifice, no fluid can return, becauſe the preſſure which ſhould force it back will be greater againſt the ſides of that duct than its orifice; which is the caſe of the bile duct entering the Duodenum, and the ureters entering the bladder. I think the beſt arguments for the air's entering into the blood by the lungs, or rather ſome particular part of the air, may be fetched from what the learned Dr. Halley, and others have obſerved of a man's wanting in a diving bell, near a gallon of freſh air in a minute, for if nothing but preſſure had been wanted from the air in the lungs, there may be thrice as much preſſure without any ſupply of freſh air, as upon the ſurface of the earth; and animals dying ſo ſoon in an air that has been burnt, and their being ſo eaſily intoxicated by breathing air much impregnated with ſpirituous liquors, are alſo, in my opinion, arguments of a paſſage this way into the blood. Beſides, if preſſure of the air in the cells of the lungs is the only uſe of it, I do not ſee but enough of that may be had while a man is hanging, if the muſcles of the Thorax do but act upon the air which was left in the Thorax, when the rope was firſt fixed, and yet death is brought about by hanging no other way than by interrupting of the breath, as I have found by certain experiments. Dr. Drake has endeavoured to ſhew, that the uſe of reſpiration is to aſſiſt the Syſtole of the heart; but this uſe requires that the Syſtole and Diaſtole of the heart, ſhould keep time with expiration and inſpiration, which is contrary to experience: Beſides, if his hypotheſis was true, it could only ſerve the right ventricle of the heart. The lungs of animals before they have been dilated with air, are ſpecifically heavier than water, but upon inflation they become ſpecifically lighter and ſwim in water; which experiment may be made to diſcover whether a dead child, was ſtill born or not; but if the child has breathed but a little, and the experiment is made long after, the lungs may be collapſed, and grow heavier than water, as I have experimented, which may lead a man to give a wrong judgment in a court of judicature; but then it will be on the charitable ſide of the queſtion.

ADHESIONS of the lungs to the Pleura are ſo common, I know not how to call it a diſeaſe; they being found ſo more or leſs in moſt adult perſons, and without any inconveniennce, if the lungs are not rotten.

PERICARDIUM or heart-purſe, is an exceeding ſtrong membrane which covers the heart; its ſide next the great veſſels is partly connected to them, and partly to the baſis of the heart; but, I think, not properly perforated by thoſe veſſels, and its lower ſide is inſeparable from the tendinous part of the diaphragm, but not ſo in brutes, in ſome of which there is a membranous bag between it and the diaphragm, which contains a lobule of the lungs. It encloſes all the heart to its baſis; its uſes are to keep the heart in its place, without interrupting its office, to keep it from having any friction with the lungs, and to contain a liquor to lubricate the ſurface of the heart, and abate its friction againſt the Pericardium. Tab. xiv. 1.

THE heart is a muſcle of a conick figure, with two cavities or ventricles; its baſis is fixed by the veſſels going to and from it, upon the fourth and fifth Vertebræ of the Thorax, its Apex, or point is inclined downward and to the left ſide, where it is received in a cavity of the left lobe of the lungs, as may be obſerved, the lungs being extended with air: This incumbrance on the left lobe of the lungs, I imagine, is the cauſe of that ſide's being moſt ſubject to thoſe pains which are uſually called pleuritic, which, I think, are for the moſt part inflammations in the lungs.

AT the baſis of the heart, on each ſide, are ſituated the two auricles to receive the blood; the right from the two cava's, and the left from the pulmonary-veins: In the right, at the meeting of the cava's, is an eminence called Tuberculum Loweri, which directs the blood into the auricle; immediately below this tubercle, in the ending of the Cava Aſcendens, is the Veſtigium of the Foramen Ovale; (Vid. chap. of the Fœtus) and near this, in the auricle, is the mouth of the coronary veins. The left auricle is abundantly leſs than the right; but the difference is ſupplied by a large muſcular cavity, which the veins from the lungs afford in that place; the ſides of this muſcular cavity are thicker than the ſides of the right auricle, in about that proportion in which the left ventricle of the heart is ſtronger than the right; their uſes being to receive blood from the veins that lead to the heart, and preſs it into the ventricles; a ſtrength in each auricle proportionable to the ſtrength of the ventricle that it is to fill with blood, ſeems neceſſary: And this different thickneſs of the coats of the auricles makes the blood in the left, which is thickeſt, appear through it of a paler red; but when it is let out of the auricles it appears alike from both; which they would do well to examine, who affirm the blood returns from the lungs of a more florid colour than it went in; and offer it as an argument of the blood's being mixed with air in the lungs: In both auricles are muſcular Columnæ, like thoſe in the ventricles, but ſmaller.

The ventricles or cavities in the heart which receive the blood, are hollow muſcles, or two cavities in one muſcle, whoſe fibres interſect one another, ſo as to make the preſſure of the heart upon the blood more effectual, and are alſo leſs liable

able to be ſeparated than they would have been if they had lain parallel; both theſe cavities receiving the ſame quantities of blood in the ſame times, and always acting together, muſt be equal in ſize, if they equally diſcharge what they contain at every Syſtole, as I doubt not but they do; nevertheleſs the left appears leſs than the right, it being found empty in dead bodies, and the right uſually full of blood, which made the ancients think the veins and the right ventricle only, were for the blood to move in, and that the left and the arteries contained only animal ſpirits; the left ventricle is much the thickeſt and ſtrongeſt, its office being to drive the blood through the whole body, while the right propels it through the lungs only. Over the entrance of the auricles in each ventricle, are placed valves to hinder a return of blood while the heart contracts. Thoſe in the right ventricle are named Tricuſpides, thoſe in the left Mitrales. One of theſe laſt ſeem to do farther ſervice, by covering the mouth of the Aorta while the ventricle fills; which ſuffering none of the blood to paſs out of this ventricle into the Aorta before the ventricle acts, it will be able to give greater force to the blood than it otherwiſe might have done; becauſe a greater quantity of blood more fully diſtending the ventricle, and making the greater reſiſtance, it will be capable of receiving the greater impreſſed force from the ventricle, and if the blood is no way hindered in the right ventricle from getting into the pulmonary artery, while the ventricle dilates as it is in the left, the left then muſt be ſomewhat bigger than the right, if they both empty themſelves alike in every Syſtole: Though the auricles of the heart are equal to each other, and the two ventricles alſo equal, or nearly equal, yet the auricles are not ſo large as the ventricles; for the ventricles contain not only all the blood which flowed from the veins into the auricles, during the contraction of the heart, but alſo that which flows (which will be directly into the heart) while the auricles contract, and the ventricles dilate; which leads us to the exact knowledge of the uſe of the auricles. If the Syſtole and Diaſtole of the heart are performed in equal times, then the auricles muſt be half the ſize of the ventricles; or whatever proportion the ſpace of time of the Syſtole of the heart, bears to the ſpace of time in which the Syſtole and Diaſtole are both performed, that proportion will the cavities of the auricles bear to the cavities of the ventricles.

THE inner fibres of each ventricle are diſpoſed into ſmall cords, which are called Columnæ: From ſome of theſe ſtand ſmall portions of fleſh called Papillæ; theſe Papillæ are tied to the valves by ſlender fibres, whereby they keep the valves from being preſſed into the auricles, by the action of the blood againſt them in the Syſtole of the heart, and when that is over, the blood flowing in between them opens them, as the preſſure of blood on the other ſide ſhuts them in the Syſtole. (For the courſe of the blood through this part, Vid. chap. of the courſe of the aliment and fluids.)

In the beginning of each artery from the heart are placed three valves, which look forward, and cloſe together to hinder a regreſs of blood into the ventricles. Thoſe in the pulmonary artery, are named Sigmoidales, thoſe in the Aorta, Semilunares, Canalis Arterioſus. (Vid. chap. of the Fœtus.)

In a boy I found a great quantity of Pus in the Pericardium, and the baſis of the heart ulcerated. In perſons that have died of a dropſy, I have uſually obſerved the heart large, its fibres lax, and the veſſels about it immoderately diſtended, and polypuſſes ſometimes in both auricles and ventricles, and in the large veins; but more frequently in the right auricle and ventricle. I diſſected a man that died tabid, in whom the Pericardium univerſally adhered to the heart, and a portion of the muſcular part of the heart was oſſified as large as a ſix-pence. The beginning of the Aorta, has been frequently ſeen oſſified, eſpecially in aged perſons. In a woman that died of a dropſie, I found the valves of the Aorta quite covered with chalk ſtones, which not ſuffering the valves to do their office, the left ventricle of the heart was conſtantly overcharged with blood, and diſtended to above twice its natural bigneſs, which I imagine deſtroyed the œconomy of the body, and occaſioned the dropſie.

Tab.ix.A.

CHAP.

CHAP. VIII.

Of the arteries and veins.

FROM the right ventricle of the heart ariſes the pulmonary artery; which ſoon divides into two branches; one to each lobe of the lungs, and then they ſub-divide into ſmaller and ſmaller branches, until they are diſtributed thro' every part of the lungs. From the extreme branches of the pulmonary artery, ariſe the ſmall branches of the pulmonary veins; which as they approach the left auricle of the heart, unite in ſuch a manner as the pulmonary artery divides going from the heart, only that the veins enter the muſcular appendix of the left auricle in ſeveral branches, and the blood being brought back from the lungs by theſe veſſels to the left auricle and ventricle of the heart, it is from the left ventricle of the heart thrown into the Aorta.

AORTA, or great artery, ariſes from the left ventricle of the heart, and deals out branches to every part of the body. The firſt part of this veſſel, is called Aorta Aſcendens; it paſſes over the left pulmonary artery, and veins and branch of the Aſpera Arteria, and being reflected under the left lobe of the lungs, it commences Aorta Deſcendens; which name it keeps through the Thorax and Abdomen where it paſſes on the left ſide of the ſpine, till its diviſion into the iliac arteries between the third and fourth Vertebræ of the loins.

From under two of the ſemilunar valves of the Aorta, which is e'er it leaves the heart, ariſe two branches (ſometimes but one) which are beſtowed upon the heart, and are called Coronariæ Cordis. From the curved part of the Aorta, which is about two or three inches above the heart, ariſe the ſubclavian and carotid arteries; the right ſubclavian and carotid in one trunk, but the left ſingle. By ſome authors theſe veſſels have been deſcribed in a different manner, but I believe their deſcriptions were, for want of human bodies, taken from brutes; for I have never yet ſeen any variety in theſe veſſels in humane bodies, though I have in the veins nearer the heart: And indeed there ſeems to me to be a mechanical neceſſity for their going off in the manner here deſcribed in human bodies; for the right ſubclavian and carotid arteries neceſſarily going off from the Aorta at a much larger angle than the left, the blood would move more freely into the left than the right, if the right did not go off in one trunk, which gives leſs friction to the blood, than two branches equal in capacity to that one; ſo that the advantage the left have by going off from the Aorta, at much acuter angles than the right, is made up to the right by their going off at firſt in but one branch.

The carotid arteries run on both ſides the Larynx to the ſixth Foramina of the ſcull, through which they enter to the brain; but as they paſs through the neck, they detach branches to every part about them, which branches are called by the names of the parts they are beſtowed upon; as, Laryngeæ, Thyroideæ, Pharyngeæ, Linguales, Temporales, Occipitales, Faciales, &c. but juſt before they enter the ſixth Foramina of the ſcull, they each ſend a ſmall branch through the fifth Foramina of the ſcull to that part of the Dura Mater which contains the Cerebrum. It is theſe arteries which make thoſe impreſſions which are ſo conſtantly obſerved on the inſide of the Oſſa Bregmatis: Theſe branches Mr. Monro obſerves oftener ariſe from the temporal arteries. The internal carotids ſend two branches to the back part of the noſe, and ſeveral branches thro' the firſt and ſecond Foramina of the ſcull to the face and parts contained within the orbits of the eyes, and then piercing the Dura Mater, they each divide into two branches, one of which they ſend under the Falx of the Dura Mater, between the two hemiſpheres of the brain, and the other between the anterior and poſterior lobes. Theſe branches take a great many turns, and divide into very ſmall branches in the Pia Mater before they enter the brain, as if large trunks would make by their pulſe too violent an impreſſion on ſo tender and delicate a part. And perhaps it may be from an increaſe of the impulſe of the arteries in the brain, which ſtrong liquors produce, that the nerves are ſo much interrupted in their uſes throughout the whole body, when a man is intoxicated with drinking; and it may alſo be from a like cauſe, that men are delirious in fevers. Beſides theſe two arteries, viz. the carotids, the brain has two more, called Cervicales, which ariſe from the ſubclavian arteries, and aſcend to the head through the Foramina, in the tranſverſe proceſſes of the cervical Vertebræ, and into the ſcull through the tenth or great Foramen; theſe two arteries uniting ſoon after their entrance, they give off branches to the Cerebellum, and then paſſing forward, divide and communicate with the carotids; and the carotid arteries communicating with each other, there is an entire communication between them all; and theſe communicant branches are ſo large that every one of theſe great veſſels, with all their branches may be filled with wax injected through any one of them, as I have often experienced.

THE ſubclavian arteries, are each continued to the cubit in one trunk, which is called Axillaris as it paſſes the arm-pits, and Humeralis as it paſſes by the inſide of the Os Humeri, between the muſcles that bend and extend the cubit. From the ſubclavians within the breaſt ariſe the Arteriæ Mammariæ, which run on the inſide of the Sternum, and lower than the Cartilago Enſiformis. As ſoon as the Arteria Humeralis has paſſed the joint of the cubit, it divides into two branches, called Cubitalis Superior and Cubitalis Inferior; which latter ſoon ſends off a branch, called Cubitalis Media, which is beſtowed upon the muſcles ſeated about the cubit. The Cubitalis Superior paſſes near the Radius, and round the root of the thumb, and gives one branch to the back of the hand, and two to the thumb, one to the firſt finger, and a branch to communicate with the

Cubitalis Inferior. The Cubitalis Inferior paſſes near the Ulna to the palm of the hand, where it takes a turn, and ſends one branch to the out-ſide of the little finger, another between that and the next finger, dividing to both, another in the ſame manner to the two middle fingers, and another to the two fore-fingers. Theſe branches which are beſtowed on the fingers, run one on each ſide of each finger internally to the top, where they have ſmall communications, and very often there is a branch of communication between the humeral and inferior cubital arteries. This communicant branch is ſometimes very large, and liable to be pricked by careleſs or injudicious blood-letters, in bleeding in the baſilic vein, immediately under which, as far as I have been able to obſerve, this branch always lies. Mr. Monro has found the ſubclavian artery divided in one ſubject into two, the exterior of which formed the Cubitalis Superior, and the inner artery, the Cubitalis Inferior; from which ſtructure he accounts for the ſucceſs in the operation of the aneuriſm ſometimes performed above the cubit. When the operation for an aneuriſm is made upon this communicant branch, it is neceſſary to tie it on both ſides of the orifice, becauſe the blood is liable to flow freely into it either way.

From the deſcending Aorta on each ſide is ſent a branch under every rib, called Intercoſtalis, and about the fourth Vertebra of the back, it ſends off two branches to the lungs, called Bronchiales, which are ſometimes both given off from the Aorta, ſometimes one of them from the intercoſtal of the fourth rib on the right ſide; and as the Aorta paſſes under the diaphragm, it ſends two branches into the diaphragm, called Arteriæ Phrenicæ, which ſometimes riſe in one trunk from the Aorta, and ſometimes from the Cœliaca; but oftener the right from the Aorta, and the left from the Cœliac. Immediately below the diaphragm ariſes the cœliac artery from the Aorta; it ſoon divides into ſeveral branches, which are beſtowed upon the liver, Pancreas, ſpleen, ſtomach, Omentum, and Duodenum. Theſe branches are named from the parts they are beſtowed on, except two that are beſtowed upon the ſtomach, which are called Coronaria Superior and Inferior, and the branch beſtowed upon the Duodenum, which is named Inteſtinalis. At a very ſmall diſtance below the Arteria Cœliaca from the Aorta, ariſes the Meſenterica Superior, whoſe branches are beſtowed upon all the Inteſtinum Jejunum and Ileum, part of the Colon, and ſometimes one branch upon the liver. A little lower than the ſuperior meſenteric artery, ariſe the emulgents, which are the arteries of the kidneys. And a little lower than the emulgents, forward from the Aorta, ariſe the Arteriæ Spermaticæ. For which, Vid. chap. of the parts of the generation in men. Lower laterally, the Aorta ſends branches to the loins called Lumbales, and one forward, to the lower part of the Colon and the Rectum, called Meſenterica Inferior. Between the Arteria Cœliaca Meſenterica Superior and Inferior, and the branches of each near the guts, there are large communicant branches to convey the blood from one to another when they are either compreſſed in any poſture, or ſtreightened by being ſtretched out in ruptures, or from any other cauſe.

As ſoon as the Aorta divides upon the loins, it ſends off an artery into the Pelvis upon the Os Sacrum, called Arteria Sacra, and the branches the Aorta divides into, are called Iliacæ, which in about two inches ſpace divide into external and internal. The Iliacæ Internæ firſt ſend off the umbilical arteries which are dried up in adult bodies, except at their beginnings, which are kept open for the collateral branches on each ſide, one to the bladder, and one to the Penis in men, and in women the Uterus; the reſt of theſe branches are beſtowed upon the buttocks, and upper parts of the thighs. The Iliacæ Externæ, run over the Oſſa Pubis into the thighs; and as they paſs out of the Abdomen, they ſend off branches, called Epigaſtricæ, to the forepart of the integuments of the Abdomen under the Recti muſcles. And the epigaſtrick arteries ſend each a branch into the Pelvis and through the Foramina of the Oſſa Innominata to the muſcles thereabouts. As ſoon as the iliac artery is paſſed out of the Abdomen into the groin, it is called Inguinalis, and in the thigh Cruralis, where it ſends a large branch to the back part of the thigh; but the great trunk is continued internally between the flexors and extenſors of the thigh, and paſſing through the inſertion of the Triceps muſcle into the ham, it is there called Poplitea; then below the joint it divides into two branches, one of which is called

Tibialis Antica; it paſſes between the Tibia and Fibula to the fore-part of the leg, and is beſtowed upon the great toe, and one branch to the next toe to the great one, and another between theſe toes to communicate with the Tibialis Poſtica; which artery, ſoon after it is divided from the Antica, ſends off the Tibialis Media, which is beſtowed upon the muſcles of the leg, while the Tibialis Poſtica goes to the bottom of the foot and all the leſſer toes. The Tibialis Antica is diſpoſed like the Cubitalis Superior; the Poſtica, like the Cubitalis Inferior; and the Media in each, have alſo like uſes. Theſe arteries which I have deſcribed, are uniform in moſt bodies, but the leſſer branches are diſtributed like the branches of trees, and in ſo different a manner in one body from another, that theſe veſſels, it is highly probable, are in no two bodies alike, nor the two ſides in any one body.

I HAVE once ſeen a rupture of matter, and once of blood and matter, which flowed out of the Abdomen into the fore-part of the thigh, through the ſame paſſage at which the iliac artery goes out of the Abdomen.

THE veins ariſe from the extremities of the arteries, and make up trunks which accompany the arteries in almoſt every part of the body, and have the ſame names in the ſeveral places which the arteries have, which they accompany. The veins of the brain unload themſelves into the Sinuſes, (Vid. chap. of the Dura and Pia Mater) and the Sinuſes into the internal jugulars and cervicals, and the internal jugulars and cervicals into the ſubclavians, which joining, make the Cava Deſcendens. The internal jugulars are ſeated by the carotid arteries and receive the blood from all the parts which the carotids ſerve, except the hairy ſcalp and part of the neck, whoſe veins enter into the external jugulars, which run immediately under the Muſculus Quadratus Genæ, often two on each ſide. The cervical veins, deſcend two through the Foramina in the tranſverſe proceſſes of the cervical Vertebræ, and two thro' the great Foramen of the ſpine, and one on each ſide the ſpinal marrow; theſe join at the loweſt Vertebra of the neck, and then empty into the ſubclavians, and at the interſtices of all the Vertebræ communicate with one another.

The veins of the arm are more than double the number of the arteries, there being one on each ſide each artery, even to the ſmalleſt branches that we can trace, beſides the veins which lie immediately under the ſkin. Thoſe which accompany the arteries have the ſame names with the arteries; thoſe which run immediately under the ſkin on the back of the hand have no proper names, they run from thence to the inſide of the elbow; where the uppermoſt is called Cephalica, the next Mediana, the next Baſilica. Theſe all communicate near the joint of the elbow, and then ſend one branch which is more directly from the Cephalica, and bears that name, until it enters the ſubclavian vein; it paſſes immediately under the ſkin, in moſt bodies, between the flexors and extenſors of the cubit, on the upper ſide of the arm. The other branches joining, and receiving thoſe which accompany the arteries of the cubit, they paſs with them by the artery of the arm into the ſubclavian vein. The external veins have frequent communications with the internal, and are always fulleſt when we uſe the moſt exerciſe; becauſe the blood being expanded by the heat which exerciſe produces, it requires the veſſels to be diſtended, and the inner veſſels, being compreſſed by the Actions of the muſcles, they cannot dilate enough, but theſe veſſels being ſeated on the out-ſides of the muſcles, are capable of being much dilated; and this ſeems to me to be the chief uſe of theſe external veſſels. The Cephalick vein as it runs up the arm, is very viſible in moſt men, but in children is rarely to be ſeen; therefore great care ſhould be taken not to wound it in the cutting of iſſues in childrens arms; and I know no way to be ſure of avoiding it, but by cutting the iſſue more externally than is uſual in men, which may be done without any inconvenience.

In the Thorax, beſides the two Cava's, there is a vein called Azygos or Vena Sine Pari, it is made up of the intercoſtal, phrenic, and bronchial veins, and enters the deſcending Cava near the auricle, as if its uſe was to divert the deſcending blood from falling too directly upon the blood in the aſcending Cava, and direct the blood of the deſcending Cava into the auricle. Beſides this vein in the Thorax, are the mammary veins, one to each Artery; and the veins of the heart which are called Coronariæ; they are twice the number of the arteries, but they enter the right auricle chiefly at one orifice.

In the Abdomen, (beſides the Cava Aſcendens, and the veins which are named like the arteries, viz. The emulgents from the kidneys, the lumbal and ſpermatick veins, the Sacra, iliac and hypogaſtrick veins) there is one large one called Vena Portæ, whoſe branches ariſe from all the branches of the cœliac and two meſenterick arteries, except the branches of the cœliac and ſuperior meſenterick, which are beſtowed on the liver, and uniting in one trunk enters the liver and is there again diſtributed like an artery, and has its blood collected and brought into the Cava by the branches of the Cava in the liver; this vein being made uſe of inſtead of an artery, to carry blood to the liver, for the ſeparation of bile. It moves in this vein about eight times ſlower than in the arteries hereabouts; and this ſlow circulation being ſuppoſed neceſſary, I think there could be no other way ſo fit to procure it; for if an artery had been employed for this uſe, and been thus much dilated in ſo ſhort a paſſage, the blood would not have moved uniformly in it, but much faſter through its Axis than near its ſides; and beſides it is very probable that the blood in this vein having been firſt employed in nouriſhing ſeveral parts, and having through a long ſpace moved ſlowly, may be made much fitter for the ſeparation of bile than blood carried by an artery, dilated to procure a circulation of the ſame velocity with that in this vein.

In the leg the veins accompany the arteries in the ſame manner as in the arm, the external veins of the foot being on the upper ſide, and from them is derived one called Saphœna, which is continued on the inſide of the limb its whole length, and has ſeveral names given it from the ſeveral places through which it paſſes.

The arteries are ſaid to have three coats, a middle muſcular, and an external and internal membranous. The veins are ſaid to have the ſame; the internal coat of an artery may be pretty eaſily ſeparated, but not the external; and though the veins have muſcular fibres, yet I could never ſeparate any one diſtinctly into three coats; and in the inſide of the veins there are many valves, eſpecially in the lower limbs, to hinder any reflux of the venal blood, which otherwiſe would have happened from the frequent actions of the muſcles on the outſides of the veins; and both the arteries and veins as they run in the inſide of a limb, or as they are diſperſed in parts that ſuffer great extenſions, as the ſtomach, guts and Uterus, they are bent in and out ſo much as that when theſe parts come to be diſtended, they may comply with thoſe diſtentions, by only being ſtreightened, and ſo preſerved from being ſtretched, which would leſſen their Diameters. The ſmall arteries near the heart go off from the large trunks at obtuſe angles, farther at leſs obtuſe angles, then at right angles, farther ſtill at acute angles, and near the extremities at very acute angles, becauſe the blood in the veſſels far from the heart moving with leſs velocity than the blood in the veſſels near the heart, the blood in the collateral branches more remote from the heart wants the advantage of a directer courſe; and becauſe a very large branch ariſing out of another, might weaken too much the ſides of the veſſel it would ariſe from; that inconvenience is prevented by encreaſing the number, and ſo leſſening the ſize of the collateral branches, where otherwiſe one large branch would have ſerved better; and in the going off of the ſubclavian and carotid arteries, which might have gone off for ſome ſpace in one trunk; but this mechaniſm is more evident in the going off of the Arteria Cœliaca and Meſenterica Superior. And the ſmall arteries always divide ſo as that the leſſer branch may lie leaſt in the direction of the blood flowing into them, which makes the blood flow moſt freely into that branch, that has farther to carry it; and the ſmaller branches ariſe more or leſs obliquely, from the ſides of other arteries, according to the proportion they bear to the arteries they ariſe from, becauſe an artery comparatively large ariſing obliquely from the ſide of another, would make an orifice in that it ariſes from too large and weaken it. And both theſe ends are at once brought about, by making the arteries that give off the branches, bend more or leſs towards the branches they give off, according to the comparative magnitude of the branches given off.

Borelli has computed the force which the heart exerts at every Syſtole, to be equal to three thouſand pounds weight, and the force which all the arteries exert at every Syſtole, to be equal to ſixteen thouſand pounds weight, and that they together overcome a force equal to a hundred and thirty ſix thouſand pounds weight; and Dr. Keill has computed that the heart in every Syſtole, exerts a force not exceeding eight ounces, (but in both theſe accounts a weight in motion is compared to a weight at reſt.) The firſt computation was made by comparing the heart with other muſcles, whoſe power to ſuſtain a weight could be beſt determined; and the latter was made from the velocity of the blood moving in an artery: Therefore if we conſider that Borelli's way of computing led him to find out the abſolute force of the heart, and Dr. Keill's the force which the heart uſually exerts, perhaps theſe very different computations may be accounted for; for if the force of the heart, which is conſtantly exerted, ſhould, compared with any other muſcle, be but in a reciprocal proportion to the frequency of their actions, and the importance of their uſes; may not the heart very fitly have a force vaſtly greater than uſually it exerts, becauſe it is always in action, and muſt be able to exert a certain force in the loweſt ſtate of health? What force the heart ever exerts in a growing man, I cannot ſay; but it muſt be leſs in each ventricle than is ſufficient to burſt the valves, which hinder the blood from returning into the auricles out of the ventricles, or than is ſufficient to break thoſe threads by which theſe valves are tied to the Papillæ. In a dog I found the force which the heart would exert, would not raiſe to one foot perpendicular height, a column of blood through the Aorta

Aſcendens. And when I inject the arteries of a child, I find a force exceeding little will throw water through all the veſſels, with a velocity equal to that with which the blood moves in thoſe veſſels when living. And if the heart like other muſcles can perform the firſt part of its contraction with moſt eaſe, is not the quick actions of the heart in the hectic fevers owing to its not being able to empty the ventricles every Syſtole, which I think will oblige it to act Cæteris Paribus ſo much the oftner. For the following ingenious attempt to account for the Syſtole and Diaſtole of the heart, and the reciprocal actions of the auricles and ventricles, I am obliged to Mr. Monro.

" Postulata, that the action of the muſ-
" cles depends on the influx of blood and Liqui-
" dum Nervoſum into the muſcular fibres, and
" therefore whenever the muſcles are deprived of
" either or both theſe fluids, their action ceaſes;
" this a great many authors have fully proved
" by tying and cutting the nerves or arteries that
" ſerve any muſcle. That all muſcles are in a
" conſtant ſtate of contraction as long as blood
" and the Liquidum Nervoſum are freely ſupply-
" ed to them, which ſeems evident from the
" Sphincter Ani and Veſicæ, and from the con-
" tinued contraction of ſuch muſcles, whoſe an-
" tagoniſts are cut aſunder or paralytic. That
" the nerves of the heart run to it between the
" auricles and arteries, and that the Arteriæ
" Coronariæ riſe from the Aorta behind the Val-
" vulæ Semilunares, both which are evident from

" diſſections. If then both auricles and ventri-
" cles are ready, upon the firſt communication
" of motion, to contract at the ſame time, the
" ventricles, as Dr. Keil well obſerves, being
" ſtronger, will firſt contract and hinder the
" contraction of the auricles, which muſt be in
" the mean time, much dilated by the influx of
" blood from the veins, while the arteries are
" alſo diſtended by the blood thrown out of the
" ventricles; therefore the cardiack nerves lying
" between the two will be compreſſed, and the
" courſe of the liquids in them ſtopped; at the
" ſame time the blood that ruſhes out of the left
" ventricle into the Aorta, puſhes the valves of
" that artery upon the orifices of the Arteriæ
" Coronariæ, ſo that no blood can enter into the
" ſubſtance of the heart: Thus both cauſes of
" contraction failing, this muſcle muſt become
" paralytick. The reſiſtance then to the contra-
" ction of the auricles being now removed, they
" will throw their blood into the ventricles; and
" the impulſion of the blood into the arteries
" from the heart now alſo ceaſing, the two great
" arteries will be conſtricted: The nerves are
" therefore now again free from compreſſion, and
" the valves of the Aorta being thruſt back up-
" on the mouth of the ventricle, the blood en-
" ters the Arteriæ Coronariæ; ſince the ventri-
" cles are again ſupplied with both the liquids,
" on which their contraction depends, they muſt
" again act. And thus as long as theſe cauſes
" continue, their effects muſt follow, i. e. as long
" as the creature lives, the heart muſt have an al-

"ternate Syſtole and Diaſtole, and the auricles
"and ventricles have reciprocal actions".

If the arteries contract, ſuppoſe a fourth part of the ſquares of their diameters at every Syſtole, and if the heart does not throw out a quantity at every Syſtole, equal to the fourth part of the ſolid contents of all the arteries when dilated, it is evident the heart does not throw the blood through the whole arterial ſyſtem, but into ſo much of the arteries neareſt the heart, as will contain four times as much as is thrown out of the left ventricle at once; and then this portion of arteries throws the blood forwards and dilates the arteries that lie next, and ſo on: But if the capacities of all the arteries taken together in their utmoſt dilations, exceed their capacities in their utmoſt contractions, juſt ſo much as the quantity of blood amounts to, which is thrown out of the left ventricle of the heart at every Syſtole, then every contraction of the heart propels the blood through the whole arterial ſyſtem, and the pulſation of the arteries thus made, will begin at the Aorta immediately after the ventricle begins to contract, and ſo go on ſucceſſively to their extremities; and while the left ventricle of the heart dilates again they will contract, and the times of the Syſtole and Diaſtole of the heart and arteries always be reciprocal. The ſections of all the remoter veſſels, being greater than a ſection of the Aorta, the blood will move ſo much ſlower in the leſſer veſſels than in the greater, as the ſections of the leſſer veſſels taken together, exceed the ſection of the greater veſſel or veſſels. The ſtrength of the coats of the arteries, if the blood preſſed equally againſt the ſides of them all, Cæteris Paribus, ought to be one to another as their circumferences, becauſe ſo much as the circumference of one artery is greater than another, ſo much greater preſſure its ſides muſt ſuſtain; but the arteries neareſt the heart, ſuſtaining the reaction of all the arterial blood, they muſt have a ſtrength yet greater than in that proportion: And the veſſels, both arteries and veins, the more diſtant they are from the head, the greater proportional ſtrength their coats muſt have, becauſe the arterial and venal blood communicating, they will preſs upon the lower veſſels, with a force proportional to the perpendicular altitude of blood above, which will be that of the perpendicular altitude of the whole body; for tho' the aſcending blood of the arteries may be ſaid not to preſs upon the deſcending, becauſe it moves another way, nevertheleſs it being thrown from the heart into one common veſſel, which afterwards divides, the blood moving both ways communicates, and that force which is neceſſary to overcome the natural inclination of the aſcending blood to deſcend, will be impreſſed alſo upon the deſcending blood, which is juſt the ſame with the weight of the aſcending blood; and the veins both from above and below communicating at the right auricle, the preſſure in them will alſo be as the perpendicular altitude of the body. So that the blood in all the veins and arteries may be compared to a fluid in a curved tube, in which that part in one leg, exactly balances that in the other, and both preſſing moſt upon thoſe parts which are neareſt the center of the earth. Accordingly we find by experience, that humours are more apt to flow to the loweſt parts, and that by laying thoſe parts upon a level with the whole body, this inconvenience is remedied; but laying a leg only in a chair does it but in part, juſt ſo much as the perpendicular altitude of the body from that part is ſhortened. There is alſo to be conſidered concerning the thickneſs of the coats of the veſſels, that the blood moving ſlower in the ſmall veſſels than in the great, the moment of the blood againſt the ſides of a ſmall veſſel, will be as much leſs than the moment of the blood againſt equal parts of a great one, as the velocity of the blood of a ſmall veſſel is leſs than that in a great one; and therefore their coats may alſo differ from the former proportion, as the velocity of the blood differs. Moſt of the ſmall veſſels in the limbs lying againſt one another are a mutual ſupport, and therefore leſs liable to be dilated or burſt than capillaries which lie in the thin membranes of cavities, ſuch as in the noſe. Hence theſe I ſuppoſe are moſt ſubject to hæmorrhages. And if hæmorrhages of blood do frequently ariſe from obſtructions in the minuteſt veſſels, does it not appear how opium and the bark, if they thin the blood inwardly taken (as they do moſt powerfully when mixed with it) come to be ſo often effectual remedies in that caſe? And the coats of the leſſer veſſels being proportionably weaker than the great ones, according to the decreaſe of the velocity of the blood, which leſſens the moment with which it moves in them, whenever the blood begins to move in them with an equal velocity, or greater, as it happens after an amputation when the great veſſels are tied, the force of the blood often overcomes the ſtrength of the coats of the ſmaller veſſels, and dilates them ſo, that ſometimes thoſe veſſels, which ſcarce bled during the operation, will in a few hours bleed vehemently. And this conſtant effort of the blood to dilate veſſels upon the obſtructions of others, I take to be one reaſon of thoſe throbbing pains which are felt in wounds when the bleeding is ſtopped, and in all violent inflammations, until the collateral branches are dilated, or the tenſion of the parts otherwiſe taken off.

The extreme branches both of the arteries and veins have very numerous communications, like thoſe in the Stamina of the leaves of plants, by which communications the blood that is obſtructed in any veſſels, may paſs off by other veſſels that are not obſtructed; and ſince the moment of the blood in the veſſels leſſens, and the friction from the veſſels encreaſes as it approaches the extremities; and ſince many of the leſſer veſſels are more expoſed to preſſure than any of the large ones, thoſe communications in the leſſer veſſels are made ſo much the more numerous. By means of theſe communications, the blood circulates in a limb that has had part amputated, and into any veſſels that have been ſeparated from the trunks that ſupplied them, which otherwiſe muſt have mortified for want of nouriſhment, and with them for the ſame reaſon, all the branches that ariſe from ſuch ſeparated veſſels; and I can diſcern no other way than by theſe communications, that the fluids contained in a large inflammation, can ſuppurate into one cavity.

If we inject by the arteries a large quantity of a coloured fluid, we find all the large veins full of that liquor, before any of the ſolid parts are much coloured with it; and upon frequent repetitions all of them much leſs coloured than I think might be expected, if it had gone into any thing near all the veſſels of the body; and I have often thrown wax or tallow coloured with vermilion or verdigreaſe, through all the arteries, and back again through the veins, even to the heart, every where filling veſſels that cannot be diſcerned without a microſcope; and all this without filling or much diſcolouring any one entire part. In viewing with a microſcope the circulation of the blood in the tail of a fiſh, the eye eaſily traces arteries to their extremities, and their return in veins; yet all the veſſels we can ſee make but a ſmall part of the whole of what we ſee; and though we are taught that the whole animal body, is a compages of veſſels ſuch as we ſee: If it were ſo, I think we could not well diſtinguiſh any; and if the ſum of the diameters of all the veſſels we can ſee, are to that of the breadths and thickneſſes of all the reſt of the parts, which we ſee at the ſame time, taken together, but as one to five, theſe veſſels then are no more than the twenty fifth part of what we ſee with them. What then ſhall we ſuppoſe the reſt of the tail, and thoſe parts which were ſo little tinged, and thoſe which were not filled with wax, in the foregoing experiments, compoſed of? Are they not compoſed of veſſels which ariſe from the arteries, as excretory ducts do in a gland but terminate in the veins? And theſe veſſels being only to convey the nutritious juices, and what elſe may be a proper vehicle for them, is it not fit the circulation in them ſhould be exceeding ſlow, that the nutritious particles may adhere the eaſier to the fibres of the veſſels, which they are to augment or repair? Beſides, if any whole part was made up of blood veſſels, or any other veſſels with fluids moving ſwiftly in them, it ſeems to me impoſſible, that one part of a limb can be very cold while another part is hot, if the warmth of the parts is owing to the fluids they contain. And if there are ſuch veſſels as theſe, the velocity of the motion of their fluid will not depend upon any proportion they bear to the veſſels they ariſe from, but upon the velocity with which their fluids are ſeparated from the arteries into them, and the proportion of the ſections of all their orifices to the ſum of their own ſections, at any diſtance where we would compare the velocity of their fluid. And the ſtrength of the coats of theſe veſſels, may not only be as much leſs than the ſtrength of the coats of an artery, as their diameters are leſs, but alſo leſs I think in that proportion in which the velocity of their fluids is leſs, and the motions more uniform, than the velocity and motion of the blood in an artery.

THE coats of the veins are much thinner than thoſe of the arteries, comparing veſſels whoſe ſections are equal, becauſe the blood moving ſlower in the veins than the arteries, it preſſes with leſs moment againſt their ſides: And beſides, the blood in the veins has nearly an equal uniform motion, but in the arteries a very unequal one, and that will require a farther difference in the ſtrength of their coats; for thoſe of the arteries muſt be equal to the greateſt natural preſſure; and if the arterial blood propels the venal, that is another reaſon for the different ſtrength of their coats.

ALL theſe things being conſidered, it appears to me to be an exceeding difficult thing to determine nearly, what proportion the fluids of an animal body bear to the ſolids, or to determine what proportion the ſum of all the areas of the minuteſt arteries bear to the Aorta, without which I think we can neither determine the comparative velocity of the blood moving in the different veſſels, nor the quantity of blood in any animal body, nor the time in which the whole maſs of blood, or a quantity equal to the whole maſs is flowing through the heart. But if each ventricle of the heart holds five ounces of blood, and they are filled and emptied every Syſtole and Diaſtole, which I think is true, and if eighty pulſes in a minute be allowed to be a common number, there then flows twenty five pounds of blood through each ventricle of the heart in a minute. Dr. Keil has ſhewn that the ſum of all the fluids in a man exceed the ſum of all the ſolids, and yet the quantity of blood which all the viſible arteries of a man will contain, is leſs than four pounds;

and if we may ſuppoſe all the viſible veins, including the Vena Portæ, hold four times as much, the whole then that the viſible veſſels can contain, is not twenty pounds; but the whole that they do contain, is but very little more than the veins can contain, ſeeing the arteries are always found almoſt empty in dead bodies, but how much the inviſible arteries and veins contain, I mean thoſe which contain ſuch a compound fluid, as is found in the larger veſſels, I know no way to judge, unleſs we knew what proportion theſe veſſels bear to thoſe that carry the nutritious juices and Serum, (if there are ſuch) without the Globuli of the blood.

Cæteris Paribus, is not the velocity of the blood in all animals proportionable to their quantity of action; and is not their neceſſity of food alſo in proportion to their quantity of action? If ſo, we may ſee how it comes to paſs, that animals which uſe no exerciſe, and whoſe blood moves extreamly ſlow in the winter, can ſubſiſt without any freſh ſupply of food, while others that uſe a little more exerciſe, require a little more food, and thoſe who uſe equal exerciſe winter and ſummer, require equal quantities of food at all times, the end of eating and drinking, being to repair what exerciſe and the motion of the blood has deſtroyed or made uſeleſs; and is not the leſs velocity of the blood in ſome animals than in others, the reaſon why wounds and bruiſes in thoſe animals do not ſo ſoon deſtroy life, as they do in animals whoſe blood moves ſwifter?

CHAP. X.

Of the lymphæducts.

LYMPHÆDUCTS are ſmall pellucid cylindrical tubes which ariſe inviſible from the extremities of the arteries throughout the whole body, but more plentiful in glands than other parts, and in greateſt number from ſuch glands as ſeparate the viſcideſt fluids, as may be obſerved in the liver and Teſtes. They cannot be diſcerned in a natural ſtate to have more than one coat, and that exceeding thin, having valves at ſmall and uncertain diſtances, to prevent the regreſs of their fluid. They have frequent communications like the veins, but do not unite ſo often; the larger trunks are in many places attended with ſmall glands, through which they run, and at the ſame time ſend communicant branches over them, that they might be ſecured againſt obſtructions from diſeaſes in thoſe glands. They all terminate in the Via Lactea, or in the large veins. All that riſe in the Abdomen empty into the Venæ Lacteæ Secundi Generis and Receptaculum Chyli; thoſe in the cavity of the Thorax into the Ductus Thoracicus and the ſubclavian veins. Their uſes are to carry lymph to dilute the chyle, to make it incorporate more readily with the blood (but not to make it flow the better in the Lacteals, as appears ſufficiently from their not entering into the minuteſt Lacteals) and to carry off ſo much lymph as is neceſſary to leave the blood in fit temper to flow thro' the veins; for it is always obſerved that in ſuch perſons as have their blood too thin, the Globuli cohere and form Moleculæ or polypuſes, which I imagine muſt ariſe from the Globuli of the blood not rubbing often enough, and with ſufficient force one againſt another to diſunite them as faſt as they cohere. Theſe polypuſes are frequently found in all the large veins, and in the right auricle and ventricle of the heart, eſpecially in ſuch bodies as die of chronic diſeaſes.

AUTHORS have hitherto deſcribed and painted theſe veſſels like ſtrings of poppies, as they appear when injected with mercury; becauſe the coat of theſe veſſels being exceeding thin, it is not able any where between the valves to reſiſt the mercury's attracting it ſelf into globules: And the ſame appearance alſo happens when they are preternaturally diſtended; becauſe the valves hindering a diſtention where they are ſeated, the ſpaces between them approach to a ſpherical figure from the equal preſſure of the fluid, according to the degree of their diſtention; but in a natural ſtate when they are filled with lymph, or when they are moderately injected with air or water, they always appear as cylindrical as the veins. Any of theſe veſſels being burſt, they cauſe a dropſy in the cavity into which they open, which is oftener in the Abdomen than the Thorax. This kind of dropſy is ſometimes cured by tapping, and I believe the reaſon why it no oftener ſucceeds is, that it generally takes its riſe from a diſeaſed liver. Out of a great number that I have opened, I remember but few whoſe livers appeared perfectly ſound; one of which being extraordinary, I will relate his caſe from his own journal. His way of life expoſing him to drink more than he thought could be conſiſtent with his health, he reſolved on a ſudden to forbear drinking any ſtrong liquors; and this being in winter time, and he catching ſome colds in ſtormy weather, he firſt became rheumatick and then dropſical; and then he came to London for a cure, October 4. 1710. He was tapped by Mr. Ferne, who took away all the water, which was above five gallons; but the Abdomen filling again very faſt, he tapped him again, October 28. November 18. December 1. December 30. January 16. and on February 17. Mr. Ferne being indiſpoſed, he was tapped by Mr. William Smith; and on February 24. by Mr. Ferne: On March 17. Mr. Ferne and my ſelf, there being a rupture at the navel, opened that with a launcet, and let out all the water that way, and endeavoured to make a Fiſtula there to prevent future tapping, but in vain, for when the belly was emptied of water the orifice would cloſe up, he not being able to bear a ſponge-tent to keep it open; and on March 24. 1711, we opened it again at the navel with a launcet, and on April 7. Mr. Ferne opened the navel, and again on April 22. at which time there being accidentally preſent one Mr. Spirling, a barber, who pretending to ſurgery, and having obſerved how Mr. Ferne did it, undertook to make the aperture in the ſame manner, which was by pinching up the ſkin, and cutting of it as is uſually done in making of iſſues; this was on April 30. he performed it again in about May 20. and again on June 11. but he not doing it to the captain's ſatisfaction was after this time diſcharged, and Mr. Ferne was deſired to do the operation again; but the gentleman being farther in the country than Mr. Ferne could conveniently go, I was deſired to attend him, which I did afterwards, and tapped him on June 25. July about 4. or 5. July 16. July 26. Auguſt 2. Auguſt 11. Auguſt 18. Auguſt 25. September 1. September 8. September 15. and on September 17. the water burſt out of it ſelf. I opened it again on September 27. a few days after which he died, after twenty nine times tapping and once opening it ſelf. At all which times he loſt above ſeventy gallons of water. When he was firſt tapped he was ſo weak he could ſcarce ſit in a chair; but he ſoon gathered ſtrength, went into the country, and drove himſelf in a chaiſe: About the ſeventeenth time he drove himſelf out of the country, and was tapped at my houſe, and drove himſelf home immediately after; and at other times would go out immediately after tapping. But for about three weeks before he died, he was almoſt conſtantly troubled with rheumatick pains, and bled frequently at the noſe, which ſeemed to be the moſt immediate cauſe of of his death.

FORMERLY in this operation only part of the water was drawn off at a time, and the tap ſometimes left in the wound to draw off more, which was exceeding painful, and ſometimes brought on a mortification; and if they drew off much water at one time the patient was in great pain, and generally fainted, which was thought to proceed from the loſs of too much of the liquor at once. But Dr. Mead obſerving that theſe ſymptoms could not proceed from the loſs of an extravaſated fluid, ſoon found the true cauſe, which was the ſudden want of the preſſure of the abdominal muſcles againſt the parts contained in the Abdomen; and in the year 1705. being then phyſician to St. Thomas's hoſpital, ordered it to be tried there in the following manner: He directed the Abdomen to be preſſed by the hands of aſſiſtants while the water was running out, and afterwards kept rolled till the muſcles recovered force to do their office, and ſo took out all the water at once without any inconvenience, which has made this operation not very painful, often ſucceſsful, and never dangerous.

I OPENED a woman who died of a dropſy in the liver, in which I found the gibbous part entirely waſted, and the coat of the liver about a quarter of an inch thick which contained about five gallons of a groſs yellowiſh fluid, in which were many hydatids about the ſize of gooſeberries and ſome pieces of matter of as bright a red as vermilion. At about fourteen years of age ſhe firſt began to feel pain in this part which returned monthly, but in time grew continual, her belly conſtantly encreaſing till ſhe died, which was in the twenty eighth year of her age, without ever having had her Menſes. All the other viſcera both in the Thorax and Abdomen were perfectly ſound, nor was there the leaſt ſign of a dropſy in any of the limbs or yellowneſs in the ſkin, which is frequent in diſeaſes of the liver.

CHAP. XI.

Of the lymphatic glands.

THE glands accompanying the lymphatics, are ſituated in the three cavities, in the interſtices of the muſcles, where the lymphatics lie with the large blood veſſels, and in the four emunctories, viz. the arm-pits and groins. In the brain is ſeated the Glandula Pinealis, which I judge to be of this ſort, having often ſeen large Lymphæducts running into it from the Plexus Choroides; and at the baſis of the brain in the Sella Turcica is the Glandula Pituitaria, into which enters a large lymphatick, as I imagine, named Infundibulum, (Vid. cháp. of the brain.) In the neck are ſituated a great many of theſe by the ſides of the carotid arteries and internal jugular veins, and two, or a ſort of double one upon the Larynx immediately below the thyroid cartilage, from which ſituation they derive the name of Thyroideæ, and juſt within the Thorax is ſeated another called Thymus. In very young children the Thymus is as large or larger than the thyroid glands; but in men theſe glands are very large, and the Thymus very ſmall, the former having encreaſed in about a double proportion of any other gland of this kind, and the latter having rather diminiſhed than encreaſed: But in brutes, ſuch as have fallen under my obſervation, it is juſt contrary. From which obſervations I am inclined to conclude, that they both belong to the very ſame lymphaticks, and that either of them encreaſing as much as both ought to do if both encreaſed, anſwers the ſame end as if both did; and that the reaſon why the Thymus encreaſes rather than the thyroid glands in brutes, is becauſe the ſhape of their Thorax affords convenient room for it to lodge in; and that in men the thyroid glands encreaſed ſo much, becauſe there is no room in that part of the Thorax where the Thymus is ſeated for a large gland to be lodged. In dogs, a porpuſs, and ſome other animals, I have ſeen the lymphaticks in the Thymus and between the Thymus and Ductus Thoracicus full of chyle, and ſo in many other lymphatics near the Via Lactea. Under the baſis of the heart, and at the ſides of the lungs, where the great veſſels enter, are many of theſe glands from the ſize of a pea to that of a hazel nut. In the Abdomen upon the loins near the kidneys, and by the ſides of the iliac veſſels are many of theſe glands, which are called Lumbales, and there are ſome at the hollow ſide of the liver, named Hepaticæ: And the meſentery is full of glands of a like appearance, but they ſeem to belong only to the lacteal veins, unleſs ſome of them which are ſeated at the baſis of the meſentery among the Venæ Lacteæ Secundi Generis, belong to the lymphatics that come from the liver, where the hepatic lymphatics paſs in their way to the Receptaculum Chyli. The glands which accompany the blood veſſels in the limbs are few, and diſtributed in no certain order; except thoſe in the four emunctories, i. e. in the arm-pits and groins, named Axillares and Inguinales.

BRUTES have ſome large ones in the thigh, commonly called the pope's-eye; theſe are ſeated about the great veſſels in the thigh, where they paſs through the Triceps muſcle. From this ſituation, and not from any thing extraordinary in theſe glands it is that wounds are there ſo dangerous. The lymphatick glands are ſaid by Nuck and others after him, to be compoſed of veſicles, and not of veſſels like other glands; and that theſe veſicles are repoſitories of lymph: But from their appearance in a natural ſtate which is very compact and uniform, there ſeems to me to be but little reaſon for ſuch a conjecture. Some have thought their uſe to be by contracting to accelerate the motion of the fluid in the lymphaticks; but that does not ſeem very probable, becauſe a muſcular coat would have been the readieſt means to produce that effect; beſides, theſe veſſels ſeldom enter any of them without detaching a branch over at the ſame time perhaps to prevent obſtructions. And if theſe glands were endued with a contracting power, which is only preſumed without any proof, it would ſtill be difficult to conceive how ſuch a power applied at uncertain ſpaces, ſhould not rather obſtruct than accelerate the motion of lymph in the lymphaticks, tics, unleſs there were valves to prevent a reflux; and even then, if this were a convenient piece of mechaniſm, it would be very ſtrange, it ſhould no where elſe in the body be made uſe of.

CHAP. XII.

Of the courſe of the aliment and fluids, abſtracted from the foregoing chapters.

THE aliment being received into the mouth, is there maſticated by the teeth, and impregnated with Saliva, which is preſſed out of the ſalivary glands by the motions of the jaw and the muſcles that move it and the tongue. (See from page 151 to page 158.)

THEN it deſcends through the Pharynx into the ſtomach, where it is digeſted by the juices of the ſtomach, (which are what is thrown out of the glands of its inmoſt coat, and Saliva out of the mouth) and a moderate warmth and attrition. (See from page 161, to page 166.)

THEN it is thrown through the Pylorus or right orifice of the ſtomach into the Duodenum, where it is mixed with bile from the gall-bladder and liver, and the pancreatic juice, from the pancreatic gland. Theſe fluids ſerve further to attenuate and dilute the digeſted aliment, and probably, to make the fluid part ſeparate better from the Fæces. After this it is continually moved by the periſtaltic or vermicular motion of the guts, and the compreſſion of the diaphragm and abdominal muſcles, by which forces the fluid parts are preſſed into the lacteals, and the groſs parts through the guts to the Anus. (See from page 166, to page 168, and from 176, to page 181.)

THE chyle, or thin and milky part of the aliment, being received into the lacteals from all the ſmall guts, they carry it into the Receptaculum Chyli, and from thence the Ductus Thoracicus carries it into the left ſubclavian vein, where it mixes with the blood, and paſſes with it to the heart. (See from page 182, to page 187.)

ALL the veins being emptied into two branches, viz. the aſcending and deſcending Cava, they empty into the right auricle of the heart; the right auricle unloads into the right ventricle, which throws the blood through the pulmonary artery into the lungs; from the lungs, the blood is brought by the pulmonary veins into the left auricle, and from that into the left ventricle, by which it is thrown into the Aorta, and diſtributed through the body. From the extremities of the arteries ariſe the veins and lymphaticks, the veins to collect the blood and bring it back to the heart, and the lymphatics to return the lymph or thinner part of the blood, from the arteries, to the veins and the Via Lactea, where it mixes with the chyle, and then paſſes with it into the left ſubclavian vein and to the heart. (See from page 193, to page 232.)

ALL the fluids that paſs into the ſtomach and guts being carried into the blood-veſſels, the greateſt part of them are ſeparated and carried off by proper veſſels, viz. urine from the kidneys, bile from the liver, &c. and theſe juices carry along with them whatever might be injurious to the animal Oeconomy. (See from page 182, to page 187.

CHAP. XIII.

Of the Dura Mater and Pia Mater.

DURA MATER, is a very compact ſtrong membrane lining the inſide of the ſcull, firmly adhering at its baſis, and but lightly at the upper part, except at the ſutures. It has three proceſſes: The firſt named Falx, begins at the Criſta Galli, and runs backwards under the Sutura Sagittalis to the Cerebellum, dividing the Cerebrum into two hemiſpheres. Its uſe is ſaid to be, to ſupport one ſide of the Cerebrum from preſſing on the other when the head is inclined to one ſide. But I think it is evident that this is not the uſe, becauſe there would be more need of ſuch a proceſs from one ſide of the ſcull to the other, than this way; and it would be alſo very neceſſary that it ſhould run through the brain, to anſwer that end. The principal uſe appears to me to be to divide the brain into ſuch portions as are leaſt liable to be moved in the ſcull, by any violent motions of the head, which is better done this way than it would the other; and the underſide

ſide of the brain is kept ſteddy by the inequalities of the baſis of the ſcull, which the brain is exactly fitted to. In brutes the Falx is always very ſmall, therefore in thoſe whoſe brains are of the larger ſize, as oxen, ſheep, horſes, &c. the upper part of the ſcull is made uneven, exactly to fit the folds of the brain, which ſecures the upper parts of their brains from concuſſions, in the ſame manner that the lower parts are ſecured. The ſecond proceſs runs from the lower and back part of the former to the upper edge of each Os Petroſum, and ſuſtains the poſterior lobes of the Cerebrum, that they might not compreſs the Cerebellum. In ſuch rapacious animals as I have diſſected, this proceſs is bone. The third is very ſmall; it runs from the laſt deſcribed proceſs down towards the great Foramen of the ſcull, and poſſeſſes the ſmall ſpace in the Cerebellum between the Proceſſus Vermiformis. Theſe proceſſes of the Dura Mater alſo ſerve to keep the brain ſteddy.

The Dura Mater has in it ſeveral ſinuſes, which are large veins to receive the blood from the leſſer veins of the brain: Their number is uncertain, and thoſe that are conſtant are not deſcribed in the ſame order by writers. The firſt that preſents it ſelf is the Longitudinalis Superior, running from a blind hole a little above the Criſta Galli all along the upper edge of the Falx. A tranſverſe ſection of this veſſel is not circular, like other veſſels, but a triangle whoſe ſides are arches of a circle; the upper ſide convex outwards, and the two lower convex inwards. The figure of this veſſel, is preſerved by ſmall ligaments running acroſs in the inſide that it might not become conical, or cylindrical, like other veſſels, from the equal preſſure of the contained blood, and thereby incommode the upper edges of each hemiſphere of the Cerebrum. On the lower edge of this proceſs is generally another very ſmall one, called Longitudinalis Inferior; this runs into the Rectus, and when wanting is ſupplied by a vein; Rectus runs between the two firſt proceſſes of the Dura Mater, and unloads with the Sinus Longitudinalis Superior into the two lateral ſinuſes; but for the moſt part the longitudinal Sinus goes more directly into one of the lateral ſinuſes, and the ſtreight Sinus into the other. There is ſometimes a ſmall one in the third proceſs, which empties in the ſame place with the former. From the endings of the longitudinal and ſtreight ſinuſes, begin the two lateral ſinuſes, which when they come to the Os Petroſum, dip down and paſs through the eighth Foramina into the internal jugular veins. There is another named Circularis, it runs round the forepart only of the Sella Turcica; the two ends of this empty into four ſinuſes, one on the top of each Os Petroſum, which paſs into the Sinus Laterales, and one at the under ſides of the ſame bones, which paſs indifferently into both the lateral and cervical ſinuſes; theſe two laſt ſinuſes have always communicant branches. The cervical ſinuſes run from the baſis of the ſcull through the great Foramen on both ſides the Medulla Spinalis Colli, and through the tranſverſe proceſſes of the cervical Vertebræ; the laſt of theſe have many times proper Foramina running from the eighth Foramina to the back-part of the Apophyſes of the occipital bone. There are alſo two more of theſe veſſels, which run from the circular Sinus between the Os Sphenoides and forepart of the Os Petroſum directly into the internal jugular veins.

PIA MATER, is an exceeding fine membrane immediately inveſting the brain even between its lobes, hemiſpheres and folds. It ſerves to contain the brain, and ſupport its blood veſſels, which run here in great numbers, for the arteries to divide into ſmall branches upon, that the blood contained may not enter the brain too impetuouſly; and for the veins to unite on, that they may enter the ſinuſes more conveniently. Between the Dura and Pia Mater, is deſcribed by ſeveral anatomiſts, a membrane called Arachnoides, which may eaſily be ſhewn at the back-part of the Cerebrum, upon the Cerebellum and back-part of the Medulla Spinalis.

I HAVE once ſeen a large part of the Dura Mater, and once part of the Pia Mater oſſified.

CHAP. XIV.

Of the Cerebrum, Cerebellum, Medulla Oblongata and Medulla Spinalis.

CEREBRUM, is that part of the brain which poſſeſſes all the upper and fore-part of the Cranium, being ſeparated from the Cerebellum by the ſecond proceſs of the Dura Mater. Its upper ſide is divided into two hemiſpheres, and its lower ſide into four lobes, two called anterior and two poſterior, which latter are much the largeſt. At the meeting of the four lobes, appears the Infundibulum, which ſeems to be a lymphatick running from the ventricles of the brain into Glandula Pituitaria. This gland is ſeated in the Sella Turcica. Immediately behind the Infundibulum appear two ſmall bodies, named Protuberantiæ Duæ Albæ Pone Infundibulum. Between the two hemiſpheres of the Cerebrum, lower than the circumvolutions, appears a white body named Corpus Calloſum. Under the Corpus Calloſum, appear the two lateral or ſuperior ventricles, which are divided into right and left by a very thin membrane, named Septum Lucidum, which is extended between the Corpus Calloſum and Fornix. The Fornix is a medullary body, beginning from the fore-part of theſe ventricles, with two ſmall roots which ſoon unite; and running towards the back-part, where they divide into two parts, called Crura Fornicis. In the baſis of theſe two ventricles, are four prominences: The two anterior are called (becauſe of their inner texture) Corpora Striata; the other two are named Thalami Nervorum Opticorum. Beyond theſe, are two more proceſſes, called Nates: And under them, nearer the Cerebellum, two called Teſtes. Above the Nates, is ſituated the Glandula Pinealis, famous for being ſuppoſed by Des Cartes, the ſeat of the ſoul. And upon the Thalami Nervorum Opticorum, are a number of blood-veſſels, glands, and lymphæducts, called Plexus Choroides. Under the beginning of the Fornex, is a ſmall Foramen called Foramen ad Radices Fornicis, or Iter ad Infundibulum. And under the middle of the Fornix, one called Foramen Poſterius, which is covered with a valve named Membrana or Valvula Major; and the ſpace under the two anterior ventricles between the Foramina and the Cerebellum, is the third ventricle.

CEREBELLUM, is ſituated under the ſecond proceſs of the Dura Mater. By dividing this part of the brain length-ways, we diſcover more plainly the fourth ventricle, whoſe extremity is called Calamus Scriptorius; here alſo appear two medullary bodies called Pedunculi, which are the baſis of the Cerebellum. The medullary part in the Cerebellum, though it is inmoſt, as in the Cerebrum, yet is of a different ſhape, being branched out like a plant.

The ſubſtance of the brain is diſtinguiſhed into outer and inner; the former is called Corticalis, Cinerea, or Glanduloſa, the latter Medullaris, Alba, or Nervea.

Medulla Oblongata, is a medullary production from the under part of the Cerebrum and Cerebellum: It firſt appears in two bodies from the anterior part of the poſterior lobes of the Cerebrum, called Crura Medullæ Oblongatæ. The union of theſe Crura between the Cerebrum and Cerebellum, is called Iſthmus; and immediately beyond this, is an eminence, named Proceſſus Annularis.

Medulla Spinalis, is a production of the Medulla Oblongata through the great Foramen of the ſcull, and through the channel of the ſpine: It enlarges about the laſt Vertebræ of the back, and firſt of the neck, where the large nerves are given off to the arms; it again enlarges in the loins, where the crural nerves begin; and the lower end of it with thoſe and other nerves, is called from its reſemblance Cauda Equina. The coats of this part are the ſame with thoſe of the brain; but the membrane here, which is analogous to the Dura Mater, is thinner and more connected to the bones, and the Tunica Arachnoides more conſpicuous.

Wounds in the Cerebrum, though very dangerous, are not mortal; but in the Cerebellum and Medulla Oblongata, they cauſe ſudden death; and in the Medulla Spinalis, loſs of ſenſe in all the parts which receive nerves from below the wound. In perſons that have died lethargic, I have always found the brain full of water; and in children the brain is always very ſoft and moiſt. In a man that died of an apoplexy, I found all the veſſels of the brain immoderately diſtended with blood, and the ventricles and the ſubſtance of the brain full of lymph, and the Pia Mater very much thickened, and adhering ſo very looſely, that the greateſt part of it was ſeparated without breaking.

I HAVE twice ſeen in the Cerebrum a ſchirrous tumour as large as a pullet's egg; and in another body, impoſthumations which poſſeſſed near two thirds of the whole Cerebrum. And in a perſon that died with a Gutta Serena, I found all the ventricles of the brain full of lymph; and the Thalami Nervorum Opticorum and the optick nerves, e'er they went out of the ſcull, made flat with the preſſure. And in an old man I found the right optick nerve waſted, and black.

CHAP. XV.

Of the nerves.

" FROM the medullary part of the Cerebrum, " Cerebellum, and Medulla Spinalis, a " vaſt number of ſmall medullary white fibres " are ſent out, which, at their firſt egreſs, ſeem " eaſily to ſeparate, but as they paſs forward are " ſomewhat more, but ſtill looſely connected, by " the coat which they obtain from the Pia Ma-

" ter, and at laſt piercing the Dura Mater, are " ſtraitly braced by that membrane which covers " them in their progreſs; whence they become " white, firm, ſtrong cords, and are ſo, well " known by the name of nerves. To theſe coats " an infinite number of veſſels, both arteries and " veins are diſtributed; ſo that after a nice, lucky " injection the whole cord is tinged with the colour of the injected liquor; but when the fibrils " are examined, even with the beſt microſcope, " they appear only like ſo many ſmall diſtinct " threads running parallel, without any cavity " obſervable in them, though ſome incautious " obſervers, miſtaking the cut orifices of the arterious and venous veſſels, juſt now mentioned, " for nervous tubes, have affirmed their cavities " to be viſible. The nerves, which if all joined, " hardly make a cord of an inch diameter, would " ſeem from their exerting themſelves every where, " to be diſtributed to each, even the ſmalleſt " part of the body. In their courſe to the places for which they are deſtined they generally " run as ſtrait, as the part over which they are " to paſs, and their own ſafety from external injuries will allow, ſending off their branches at " very acute angles, and conſequently running " more parallel than the blood veſſels. Their diſtribution is ſeldom different in the oppoſite " ſides of the ſame ſubject, nor indeed in any " two ſubjects is there conſiderable variety found. " Frequently nerves which come out diſtinct or " ſeparate, afterwards conjoin into one Faſciculus, under the ſame common covering; and

" though the nervous fibrils probably do not " communicate, (the reaſon of which opinion " ſhall immediately be given) yet becauſe the " coats, at the conjoined part are common, and " theſe ſtrong coats may have great effects on the " ſoft pulpy nerves, it is evident all ſuch will " have a conſiderable ſympathy with one another, " whereof ſeveral examples in practice ſhall be " inſtanced when the particular nerves are de-" ſcribed. In ſome parts where there are ſuch " conjunctions, the bulk of the nerves ſeems " much increaſed, and theſe knotty oval bodies, " called by Falloppius Corpora Olivaria, and ge-" nerally now named ganglions, are formed; the " coats of theſe knots are ſtronger, thicker, and " more muſcular, than the whole nerves which " enter into them would ſeem to conſtitute, while " the nervous fibrils paſs through without any " great alteration or change. I do not think any " author has yet made a probable conjecture of " the uſe or deſign of theſe ganglions, whether " they imagine them Corcula Expellentia, reſer-" voires, or elaboratories, neither can I give an " account of their uſe the leaſt ſatisfactory to " my ſelf.

" FROM undeniable evident experiments, all " anatomiſts are now convinced that to the " nerves we owe all our ſenſation and motion, " of which they are proper organs; and the ſen-" ſations in the minuteſt parts being very diſtinct, " therefore the inſtruments of ſuch ſenſations " muſt have diſtinct origins and courſe to each

" part. Though all are agreed as to the effect, " yet a hot diſpute has aroſe about the manner " how it is produced, viz. whether ſenſation and " motion are occaſioned by a vibration communicated to the nerves, which theſe gentlemen " ſuppoſe entirely ſolid and tenſe, or by a liquid " contained and moved in them. The laſt of " theſe opinions I rather incline to for theſe reaſons, becauſe the nerves proceeding from the " brain bear a great analogy to the excretory " ducts of other glands. Then they are far from " being ſtretched and tenſe in order to vibrate: " And what brings the exiſtence of a liquid in " their cavities next to a demonſtration, is the " experiment firſt made by Bellini, and related " by Bohn and Pitcairn, which I have often done " with exact good ſucceſs; it is this: After opening the Thorax of a living dog, catch hold " of and compreſs the phrenick nerve, immediately the diaphragm ceaſes to act; remove the " compreſſing force, that muſcle again contracts; " gripe the nerve with one hand ſome way above " the diaphragm, that Septum is unactive; then " with the other hand ſtrip down the nerve from " the firſt hand to the diaphragm, this muſcle again contracts; after once or twice having ſtripped the nerves thus down, or exhauſted the liquid contained in it, the muſcle no more acts, " ſqueeze as you will, till the firſt hand is taken " away or removed higher, and the nerve ſtripped, i. e. the liquids in the ſuperior part of the " nerve have free acceſs to the diaphragm, or are " forced down to it, when it again will move.

" Now if this liquid ſhould be granted to us, I am
" afraid we ſhall be ſtill as much at a loſs to ac-
" count for ſenſation and motion as ever; and
" therefore all I ſhall aſſume is what is founded
" on experiments, that theſe two actions do de-
" pend on the nerves; that ſenſations are pleaſant
" as long as the nerves are only gently affected
" without any violence offered them; but as ſoon
" as any force applied goes beyond this, and
" threatens a ſolution of union, it creates that un-
" eaſy ſenſation pain; that the nerves, their
" ſource, or their coats being vitiated either con-
" vulſion or palſy of the muſcles may enſue.

" THE nerves are diſtinguiſhed into two claſ-
" ſes, of the Encephalon and Medulla Spinalis;
" of the firſt there are generally ten pair reckon-
" ed, of the laſt thirty. I ſhall deſcribe the
" nerves in the ſame order in which they are ge-
" nerally ranked, though it is not poſſible to pro-
" ſecute the diſſection of them after the ſame
" manner; but to ſupply this, I ſhall mention al-
" ſo the order wherein they may be all demon-
" ſtrated on one ſubject. When I aſſign the ori-
" gin of any nerve from any particular part, I de-
" ſire it may be underſtood of that part of the
" ſurface of the Medulla where the nerve firſt ap-
" pears; for by this method we will ſhun any diſ-
" pute with thoſe authors who trace their riſe
" too minutely, and perhaps be leſs liable to miſ-
" take or to deceive our readers. Nor ſhall I be
" over anxious about the terminations of the Mi-
" nimæ Fibrillæ, ſince it is not poſſible to trace
" them Ad Ultimos Fines, nor do I think very

“ neceſſary for explaining any Phænomena, while “ very often in a multiplicity of words, the whole “ deſcription comes to be obſcure or unintelli- “ gible.

“ Of the ten pair proceeding from the Ence- “ phalon, the firſt is the olfactory, which in “ brutes, juſtly enough, has the name of Proceſ- “ ſus Mammillares beſtowed on them, being large “ and hollow, and are indeed evidently the two “ anterior ventricles of the brain produced; which “ ſtructure, and the lymph conſtantly found in “ them, induced the antients to believe that they “ ſerved as emunctories to convey the ſupera- “ bundant Mucus from the cold moiſt brain to “ the noſe; but in man they are ſmall, long, and “ without any cavity, riſing from that part of the “ brain where the carotid arteries are about to “ enter, and running under the anterior lobes of “ the brain become a little larger, till they reach “ the Os Cribriforme, into the Foramina, of “ which the ſmall filaments inſinuate themſelves, “ as upon gently pulling thoſe nerves or after “ having cut them very near the bone is evident, “ and are immediately ſpread on the Membrana “ Narium. Their tender ſtructure and ſudden “ expanſion on ſuch a large ſurface, make it im- “ poſſible to trace them on the membrane of the “ noſtrils, which has given ſome handle to ſeve- “ ral authors to deny them the ſtructure or uſe of “ nerves.

“ The ſecond are the optick, which ariſe ſin- “ gle from the Thalami Nervorum Opticorum, “ and then uniting at the fore-part of the Cella

“Turcica, they ſeem to be pretty much blended; afterwards they divide, and running obliquely forwards, paſs out at their proper hole of the ſphenoide bone, and enter the globe of the eye to be expanded into the Membrana Retina. From this conjunction of theſe nerves, authors generally endeavour to account for our ſeeing objects ſingle, whereas we have reaſon to believe fiſhes, the chameleon, &c. whoſe optick nerves ſimply croſs one another without any ſuch union, do ſee objects alſo ſingle, ſince they ſo exactly ruſh on their prey; whereas, if thoſe authors aſſertions were true, they would oftener catch at the ſhadow than the ſubſtance. The blood veſſels running through the middle of theſe nerves, and the ramifications of the Retina are very obſervable, whence we may deduce the reaſon of Picard's experiment of ſuch objects as fall on the entry of the optick nerve being loſt to us, and hence alſo an account may be given of an Amauroſis or Gutta Serena.

“The third pair of nerves firſt appear at the anterior part of the Proceſſus Annularis, and and going out at the Foramen Lacerum are diſtributed to the globe of the eye; Muſculus Rectus Fallopii, Attollens, Adducens, Deprimens, and Obliquus Minor; therefore this pair has juſtly got the name of Motores Oculi.

“The fourth pair, which are the ſmalleſt of any, derive their origins from the anterior lateral part of the Proceſſus Annularis, and go "out at the Foramina Lacera to be entirely ſpent "on the Muſculi Trochleares, or Obliqui Majores Oculorum, to which muſcles chiefly the "rotatory motion of the eyes in ogling and the "advance of the eyes forward in ſtaring, and fury, is owing; for which reaſon anatomiſts have "called theſe nerves Pathetici.

"The fifth pair riſe from the ſides of the annular proceſs, and after piercing the Dura Mater divide into three branches; the firſt of which "is the Opthalmick, which as it is about to enter "the orbit by the Foramen Lacerum, ſends off "a ſmall twig that aſſiſts in the formation of the "intercoſtal, and then the nerve is diſtributed "to the Glandula Lacrymalis, fat, membranes, "and Palpebræ of the Eye, while it ſends one "conſiderable branch through the Orbiter Internus Anterior hole to be loſt in the Membrana "Narium, and a ſecond paſſes the Foramen and "Supercilia to ſupply the muſcles and teguments "of the forehead. Hence we eaſily diſcover "what part is affected in that painful diſeaſe the "megrim, when the eye-ball and forehead are "racked, and ſuch a heat is felt within the noſe: "Hence alſo we may learn how the muſcles of "reſpiration come to be ſo much affected on the "application of any acrid irritating ſubſtance to "the Membrana Narium, as to produce that "violent convulſive motion, ſneezing. The ſecond branch of the fifth pair, which may be "called Maxillaris Superior, paſſes out through "the Foramen Rotundum Oſſis Sphenoidis, and "immediately gives the nerves to the fat under

" the crotaphyte muſcle, and to the palate, Sinus
" Sphenoidalis and noſtrils. The remaining
" trunk inſinuating it ſelf into the channel
" on the top of the Antrum Highmorianum,
" to which cavity and to the teeth of the upper
" jaw it gives ſmall twigs, at laſt comes out at
" the Orbiter Externus hole, and is ſpent on the
" Muſculus Orbicularis Palpebrarum, noſe and
" upper lip, where ſome branches of the ſeventh
" pair ſeem to unite themſelves to the twigs of
" this. The third branch or Maxillaris Inferior
" goes out at the Foramen Ovale, or fourth hole
" of the wedg-like bone, and ſoon ſplitting into
" a great many branches, is diſtributed to the
" Muſculus Crotaphites, Maſſeter, Pterygoides,
" Digaſtricus, Buccinator, Mylohyoideus, Geniohyoideus,
" Genio-gloſſus and Baſio-gloſſus,
" Glandula Sublingualis, Maxillaris Inferior, and
" Parotis, to the external ear where it ſeems to
" join the Portio Dura to the ſubſtance of the
" tongue, in which it is pretty much confounded
" with the ninth pair: From the root of this laſt
" branch the Chorda Tympani is reflected. The
" laſt ramification of this branch which I ſhall
" mention, is that which enters into the canal of
" the lower jaw, furniſhes the teeth there, and
" comes out at the chin, on which and the lower
" lip it is beſtowed; at this place it is again conjoined
" to the ſeventh pair. From this ſhort
" ſketch of the large fifth pair of nerves, and by
" obſerving ſeveral Phænomena which happen to
" thoſe parts to which they are diſtributed, we
" might have a much farther confirmation of the

“ general doctrine of nerves delivered, and ſee,
“ at leaſt, the way pathed to a rational account
“ of theſe Phænomena, for reaſoning of which
“ we ſhould not otherwiſe have the leaſt ground.
“ We can, for example, from the Chorda Tym-
“ pani and the nerves of the teeth being derived
“ from the ſame common trunk, underſtand how
“ the ſound of any vibrating body held between
“ our teeth is ſenſible to us, when another can-
“ not poſſibly hear the leaſt on't. By the like
“ rule we know why in a violent tooth-ach the
“ muſcles of the face are ſometimes convulſed;
“ nor ſhall we be ſurprized to hear one plagued
“ with the ach in his upper teeth, complain of a
“ gnawing pain deep ſeated in the bones of his
“ face, or to ſee his eyelids much ſwelled, or
“ the tears trickling down in great abundance;
“ whereas the lower teeth aching, the ear is
“ pained, and the Saliva flows in great quanti-
“ ties. We may have ſome diſtant views of ſome
“ foundation in reaſon for the cure of the tooth-
“ ach, by ſtrong compreſſion of the chin, or by
“ applying bliſters behind the ears, or by burning
“ behind or on the ear. Among a great many
“ inſtances of the good effect of the actual cau-
“ tery in ſuch a caſe, I ſhall give one which ſeems
“ to me remarkable. I. M. was ſeized with the
“ tooth-ach, a convulſion of that whole ſide of his
“ face followed whenever the pain became acute,
“ or he attempted to ſpeak; after he had under-
“ gone blooding, purging, ſalivation, ſetons, &c.
“ without any benefit, he was cured by applying
“ a ſmall cauteriſing iron to the Antihelix.

" The ſixth pair of nerves ariſing from the " fore part of the Corpora Pyramidalia, after " piercing through the Dura Mater, give off a " branch, which joined with the reflected twig " of the ophthalmick branch of the fifth pair, " forms the original of the intercoſtal, paſſes " through the Foramen Lacerum to be ſpent en" tirely on the Muſculus Abductor Oculi, ſup" poſing this nerve to ſupply ever ſo little leſs " than a due proportion of Liquidum Nervo" ſum, an involuntary Strabiſmus will be occa" ſioned.

" Though the fifth and ſixth pair of nerves " form entirely the beginning of the inter" coſtal before it goes out of the ſcull, yet be" cauſe ſeveral other nerves contribute towards " the formation of its trunk before it ſends off " any branches, I ſhall superſede the deſcription " of it till the original nerves are ſpoke to.

" The ſeventh pair appears coming out from " the ſide of the root of the annular proceſs, " and entering the Meatus Auditorius Internus, " and immediately dividing one part, ſoon loſes " its firm coats, and is expanded on the inmoſt " Camera of the ear, while the other paſſing " through the Aquæductus Fallopii comes out of " the ſcull involved in all its coats between the " ſtyloide and maſtoide proceſſes; whence we " ſee the reaſon of the firſt being named Portio " Mollis, and the other Dura: This laſt after " its exit ſupplies the Muſculi Obliqui Capitis " Stylohyoidei, Styloglofſi and Stylopharyngei, " and Platyſma Myoides, on which and to the

" ſkin of the neck, a great number of its ſmall " filaments run, which are ſometimes cut in open- " ing the jugular vein, whence pain at firſt, and " a little numbneſs afterwards. The ſuperior " branches of it ſupply the parotid gland, exter- " nal ear and whole ſide of the face as far for- " wards as the chin. It is ſaid to communicate " thrice with the fifth pair, and twice with the ſe- " cond vertebral. May we not from hence ſee " ſome reaſon why the head is ſo ſoon moved " by the impreſſion of ſound on our ear?

" The eighth pair of nerves derive their ori- " gin from the ſide of the baſis of the Corpora " Olivaria, where their looſe filamentous texture " is very conſpicuous; then running to the hole " common to the Oſſa Temporum and Occipitis, " they are there joined by the Acceſſorius Wil- " liſii, which has its beginning from the two or " three ſuperior nerves of the Medulla Spinalis, " and mounts upwards thither, to paſs out with " the eighth pair, at that common Foramen juſt " now mentioned: Very ſoon after they, wrap- " ped up in the ſame coat, have got out of the " Cranium, the Acceſſorius ſeparates from its " companion, and after paſſing through the " middle of the Muſculus Maſtoideus is loſt in " the Muſculus Trapezius and Rhomboides Sca- " pulæ. While the large trunk, which from the " great number of branches it ſends off obtains " the name of Vagus, runs ſtrait down the neck, " near the carotid artery, in its courſe giving ſe- " veral branches to the Larynx: When entered " the Thorax it ſplits into two; the anterior

" ſerves the Pericardium, ſends branches to join " with thoſe of the intercoſtal that go to the " heart, and then on the right ſide turns round " the ſubclavian, and on the left round the great " curvature of the Aorta to mount again upwards on the ſide of the Œſophagus to be loſt " in the Larynx. This recurrent branch it is that " we are earneſtly cautioned to avoid in Bronchotomy, though by reaſon of its deep ſituation " we are in no hazard of it. If both theſe nerves " were cut, it is probable the voice would not " be entirely loſt as long as the ſuperior branches " ſtill ſupply the Larynx. The poſterior branch " of the eighth pair goes along with the Œſophagus, and ſupplies the lungs, the Gula and ſtomach very plentifully: And as all the nerves " beſtowed on this Viſcus enter at the ſuperior " orifice of it, the ſenſation here muſt be very " acute; whence Helmont imagined the mouth " of the ſtomach to be the ſeat of the ſoul. What " remains of this Par Vagum is adjoined to the " intercoſtal immediately below the diaphragm.

" The ninth pair appears firſt at the inferior " part of the Corpora Pyramidalia, and march " out at their proper holes of the Occipitis, and " after ſending off ſome nerves to the Glandula " Thyroidea, and Muſculi Sterno-Hyoidei, and " Sterno-Thyroidei, are loſt in the ſubſtance of " the tongue. Authors have diſputed whether " this ninth or the fifth is the guſtatory nerve; " the old opinion in favour of the ninth is to me " moſt probable, becauſe the fifth is no where " elſe employed as an organ of ſenſation, becauſe

“ the ninth ſeems to penetrate the ſubſtance of the tongue more, while the fifth is ſpent on the muſcles.

“ The tenth pair comes out from the beginning of the Medulla Spinalis betwixt the Os Occipitis and firſt Vertebra Colli, and is all, except what goes to the ganglion of the intercoſtal, ſpent on the Muſculi Obliqui, and Extenſores Capitis.

“ The only nerves proceeding from the Encephalon not deſcribed, are the reflected branches of the fifth and ſixth, which indeed are ſo ſmall and pappy, and hid by the carotid artery as they go out with it in its crooked canal, as not to be eaſily traced, but whenever they have eſcaped from the Os Petroſum they are joined by branches from the eighth, ninth, tenth, and firſt and ſecond ſpinal; and the largeſt ganglion of the body is formed, from which the nerve named now intercoſtal goes out to deſcend down the neck with the carotid, ſupplying in its courſe the Muſculi Flexores of the head and neck, and communicating with the cervical nerves. As the intercoſtal is about to enter the Thorax, it again forms a ganglion, from which nerves to the Trachea Arteria and the heart are ſupplied, which join with the branches of the eighth, and paſs between the two large arteries and auricles to the ſubſtance of that muſcle. Now let any one conſider the egreſs of the intercoſtal, and cloſe courſe of it and the eighth with the carotid artery, and this manner of entry of the cardiac

" nerves, ſurely the alternate conſtriction and relaxation of the heart will appear neceſſarily depending on the diſpoſition of theſe organs of motion, the nerves. The intercoſtal after this runs down on the ſide of the Vertebræ Thoracis, having additional nerves conſtantly ſent to it from between theſe Vertebræ, till it paſs through its own proper hole of the diaphragm; whence it again forms another ganglion cloſe by the Glandulæ Renales, into which the eighth pair enter. From ſuch a knot on each ſide, the nerves of the guts, liver, ſpleen, Pancreas and kidneys are derived, nay the extremity of this nerve is ſent down to the Pelvis to ſupply the parts there. Hence the great ſympathy of theſe parts may be eaſily deduced, and a reaſon may be given of the violent vomiting that commonly attends a Nephritis, and of the belching cholicks and ſtomach-achs, which often enſue on the obſtructions of the Menſtrua.

" BEFORE I proceed to the ſpinal nerves, I ſhall ſet down the order in which theſe nerves already deſcribed, are to be diſſected in order to demonſtrate them all in one ſubject, but to them muſt aſſume the three firſt cervical nerves, the reaſon of which will be evident afterwards.

" PORTIO Dura ſeptimi, Frontalis quinti, Facialis quinti, Mentalis quinti, Spinalis ſecundus, Spinalis primus, Olfactorius, Ophthalmicus quinti, Motorius Oculi, Patheticus ſextus, Opticus, Maxillaris inferior quinti, Maxillaris ſuperior

" perior quinti, Acceſſorius Williſii, nonus, deci-" mus, octavus Intercoſtalis, PortioMollis ſeptimi.

" The thirty pair of nerves proceeding from " the Medulla Spinalis, are generally divided in-" to four ſpecies, of the neck ſeven, of the back " twelve, of the loins five, and of the Os Sa-" crum ſix. Now as the Medulla Spinalis has " none of theſe inequalities ſo obſervable on the " Medulla Oblongata Encephali, the riſe of the " nerves is not ſo accurately deſcribed, being " only determined by the bones through which " they paſs.

" The firſt cervical goes out between the firſt " and ſecond Vertebra, and, after ſending off " branches that communicate with the tenth and " ſecond Vertebrale, is ſpent on the Muſculus " Flexus Colli, Splenius, Complexus, and tegu-" ments of the Occipitis.

" The ſecond cervical communicates with " the ninth, and with the firſt and third of the " neck, and then is diſtributed to the Teguments " of the neck and ſide of the head, and to the " Glandula Parotis and external ear, where it " joins with the Portio Dura.

" The third of the neck paſſes out between " the third and fourth Vertebra, ſoon communi-" cating with the ſecond, and ſending down a " large branch, which being joined by another " from the fourth forms the phrenick nerve that " runs along the Pericardium to be loſt in the " diaphragm. In this courſe the right phrenick " is obliged to make a ſmall turn round that part " of the Pericardium which covers the Apex of

" the heart. Hence it is, that ſuch as have " ſtrong palpitations of the heart, feel a pungent " acute pain immediately above the right orifice " of the ſtomach. The other branches of this " third cervical are diſtributed to the Muſculus " Trapezius and Deltoides, and to the tegu- " ments on the top of the ſhoulder; which, " with the deſcription of the eighth pair, leads " us evidently to the reaſons of the divine Hip- " pocrates's obſervation, that an inflammation of " the liver is generally attended with a hick-up, " and a ſuppuration of that Viſcus with a violent " pain on the top of the ſhoulder. However " we are not hence to conclude ſo generally as I " have obſerved phyſicians frequently do, that " if the Hypochondria are affected, and this pain " of the ſhoulder is felt, therefore the liver is " ſuppurated, for any other cauſe ſtimulating or " ſtretching the nerves, ſuch as inflammation, " wounds, ſchirrous or ſteatomatous tumors, &c. " may produce the ſame effect.

" The fourth cervical, after ſending off that " branch which joins with the third to form the " phrenick, runs ſtrait to the Axilla, where it " meets with the fifth, ſixth and ſeventh cervi- " cals, and firſt dorſal that eſcape in the interſti- " ces of the Muſculi Scaleni; and all of them " are ſo often conjoined and blended, after they " have given off nerves to the muſcles of the " neck, ſcapula, arm, and Thorax, and to the " teguments, that when the ſeveral ramifications " go off in the Axilla to the different parts of " the ſuperior extremity, 'tis impoſſible to de-

" termine which of them the branches belong to. " The conſiderable branches into which they are " divided are ſix; theſe I ſhall preſume to give " proper diſtinguiſhing names to, by which the " deſcription will be leſs confuſed, and the young " anatomiſt's memory better aſſiſted to retain " what is ſo difficult to repreſent in words.

1. " CUTANEUS runs down the fore-part of " the arm, and ſerves the teguments, as far as " the palm of the hand and fingers.

2. " MUSCULO-CUTANEUS, or Perforans " Caſſerii paſſes through the Muſculus Coraco-" Brachialis, and after ſupplying the Biceps and " Brachiæus Internus, is ſpent on the teguments " of the back of the Cubitus and hand.

3. " MUSCULARIS, that runs down the fore " part of the arm to be loſt in the Muſculi Flex-" ores Carpi, Digitorum, &c.

4. " ULNARIS, which ſupplies the Extenſo-" res Cubiti, and teguments of the elbow, and " then paſſing through the ſinuoſity at the back " of the external condyle of the Humerus, runs " along the Ulna, where it gives twigs to the " teguments and neighbouring muſcles, at length " is loſt in the back of the hand, Muſculi Inter-" oſſei and Lumbricales in the little finger, and " ſide of the ring-finger next to this. The courſe " of this nerve is ſufficiently felt when we lean on " our elbow, by the inſenſibility and prickling " pain in the parts to which it is diſtributed.

5. " RADIALIS, goes down the fore part of " the arm near the Radius, beſtowing branches " in its progreſs on the circumjacent muſcles,

“ and at the Ligamentum Annulare Carpi ſplitting, is ſent to the thumb, fore finger, middle finger, an half of the ring finger, and to the back of the hand.

6. “ Articularis runs almoſt round the top of the Os Humeri, and ſerves the Muſculi Extenſores Cubiti, Retractores and Elevatores Humeri.

“ By a ſtrong and continued preſſure on theſe nerves, by crutches, or any ſuch hard ſubſtance a palſy and atrophy of the arm may be occaſioned.

“ The twelve dorſal nerves all communicate with one another; as ſoon as they make their way out betwixt the Vertebræ, each of them gives a poſterior branch to the Muſculi Erectores Trunci Corporis; the firſt, after having ſent off the brachial nerve, already deſcribed, is after the ſame manner, with the ſucceeding eight, beſtowed on the Pleura and intercoſtal muſcles, the tenth and eleventh are moſt of them ſent to the abdominal muſcles, the twelfth communicates with the firſt lumbar, and is beſtowed on the Muſculus Quadratus Lumbalis and Iliacus Internus.

“ The fifth lumbar alſo communicates and gives poſterior branches; the firſt ſends ſeveral branches to the abdominal muſcles, and Pſoas and Iliacus, while others go from it to the teguments and muſcles on the ſuperior and anterior part of the thigh, and the main trunk of it is loſt in the crural. The ſecond paſſes thro’ the Pſoas muſcle, and is diſtributed much as the

“ former. The third is loſt in the Muſculus Pe-
“ ctineus. Branches proceeding from the firſt,
“ ſecond and third make up one trunk, which
“ runs along the anterior part of the Pelvis, and
“ ſlipping through a ſmall ſinuoſity in the ante-
“ rior part of the Foramen Magnum Oſſis Iſchii,
“ is ſpent in the Muſculus Triceps. This nerve
“ is commonly known by the name of Obtura-
“ tor, or poſterior crural nerve. By the union
“ of branches from the firſt, ſecond, third, and
“ fourth lumbar nerves, the anterior crural nerve
“ is formed, which running along the Muſculus
“ Pſoas, eſcapes with the large blood-veſſels out
“ of the Abdomen below the tendinous arcade
“ of its muſcles, and is diſtributed to the muſcles
“ and teguments on the fore part of the thigh:
“ One branch of this crural nerve accompanies
“ the Vena Saphena as far as the ancle. Now let
“ us imagine the ſituation of the kidney upon,
“ and the courſe of the Ureter over theſe nerves,
“ and we ſhall not be ſurprized, that in a Ne-
“ phritis, the trunk of the body cannot be raiſed
“ erect without great pain; that the thigh loſes
“ of its ſenſibility, and that it is drawn forwards.
“ The remainder of the fourth and the fifth lum-
“ bar nerves join with the firſt, ſecond, and third
“ that proceed from the Os Sacrum: Theſe five,
“ when united, conſtitute the largeſt nerve of
“ the body, ſo well known by the name of the
“ ſciatic, or iſchiatic nerve, which ſeems to be
“ bigger, in proportion to the part for the uſe
“ of which it is, than the nerves of any other
“ part are; the deſign of which may be to af-
ford

"ford ſufficient ſtrength to the muſcles of the lower extremity, for exerting a force ſuperior to what is required in any other part of the body. When this nerve is any way obſtructed, we ſee how unable we are to ſupport our ſelves, or to walk. The ſciatic nerve then goes out at the large hollow, behind the great tubercle of the Os Iſchium, and paſſing over the Quadrigemini muſcles, runs down the poſterior part of the thigh, giving off, every where as it goes, nerves to the teguments and muſcles of the thigh and leg. At the ham it ſplits into two; the ſmaller mounts over the Fibula, and ſerving the Muſculi Peronei, Flexores Pedis, and Extenſores Digitorum, is continued to the toes along the broad of the foot, while the larger trunk ſinks under the Muſculi Gemelli, and then divides; one is ſpent on the muſcles at the back of the leg and teguments, while the other is continued by the inner ancle to the foot, and then ſubdivides; one branch is diſtributed after the ſame manner as the Ulnaris, and the other as the Radialis in the hand.

"THE other nerves that come of the Os Sacrum are ſent to the organs of generation, Muſculi Levatores Ani and Obturatores.

"THESE nerves of the Medulla Spinalis may all be diſſected and demonſtrated in the ſame order in which they are deſcribed."

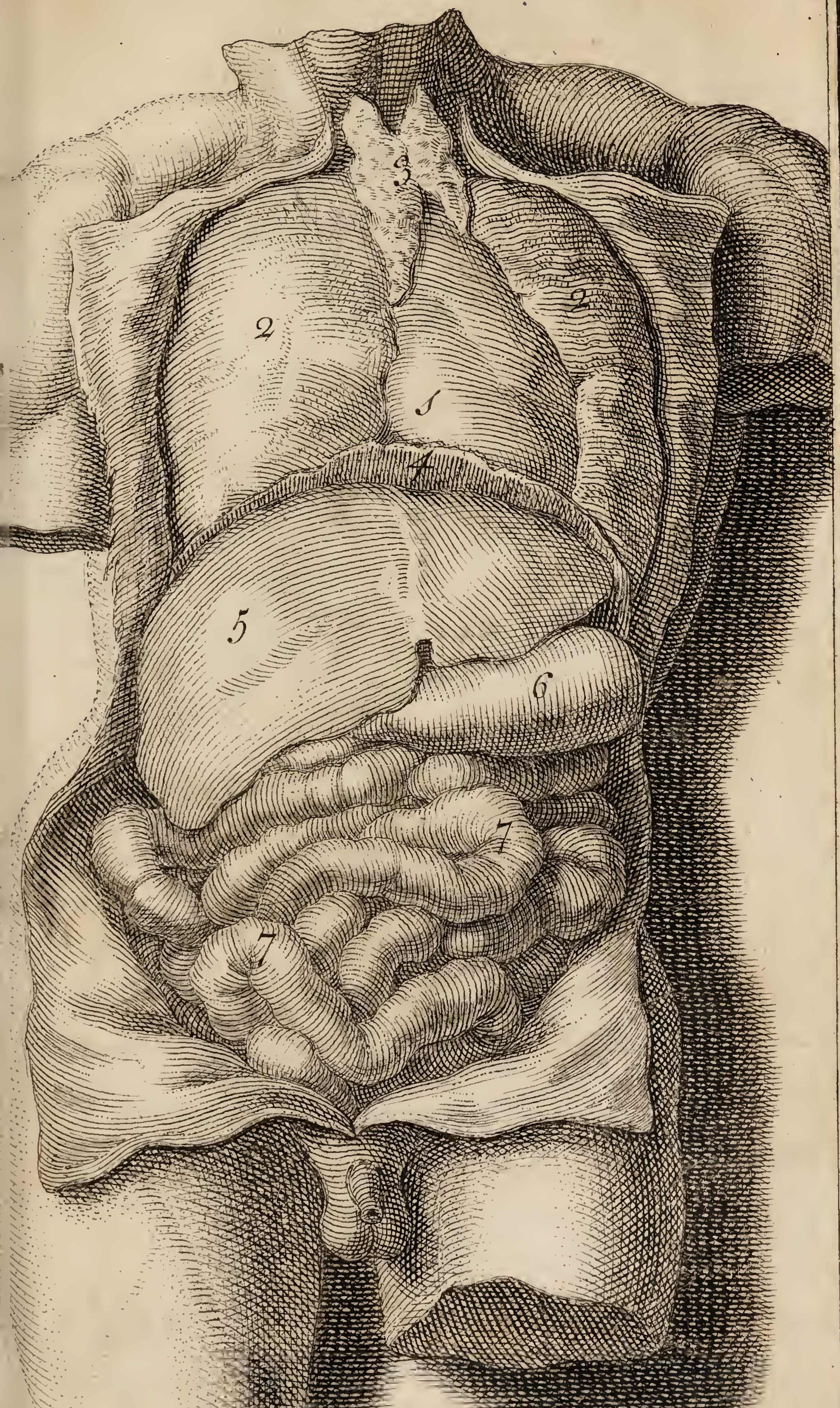
THE nerves ſeem, when examined with a microſcope, to be bundles of ſtrait fibres not communicating with one another: And I am inclined to think that every the minuteſt nerve, terminating in any part, is a diſtinct cord from its origin in the brain, or ſpinal marrow; or elſe I do not ſee how they could produce diſtinct ſenſations in every part; and the diſtinct points of ſenſation throughout the body are ſo very numerous, that the whole body of nerves (which taken together would not make a cord of an inch diameter) muſt be divided into ſuch a number, to afford one for every part that has a diſtinct ſenſation, that ſurely ſuch a nerve would be too ſmall to be ſeen by the beſt microſcope. They all paſs in as direct courſes to the places they ſerve as is poſſible, never ſeparating nor joining with one another but at very acute angles, unleſs where they unite in thoſe knots which are called ganglions, the uſe of which I do not pretend to know; they make what appears to be a communication of moſt of the nerves on the ſame ſide, but never join nerves of oppoſite ſides.

THAT the nerves are inſtruments of ſenſation, is clearly proved from experiments, but how they convey thoſe ſenſations to the brain, is matter of great diſpute. The moſt general opinion is, that they are tubes to contain animal ſpirits, by whoſe motions theſe ſenſations are conveyed: And diligent enquiry has been made to diſcover their cavities, but hitherto in vain; and if each nerve is diſtinct from its origin, as I have endeavoured to ſhew, and too ſmall to be the object of the beſt microſcope, I do not ſee how ſuch cavities are like to be diſcovered. However, I think the nerves may be tubes, and that a fluid, whoſe coheſion is very little, and whoſe parts are perhaps no finer than light, may move very freely in them. Thoſe who deny animal ſpirits in the nerves, ſuppoſe that the ſenſation is conveyed by a vibration. To which it is objected, that they are ſlack, moiſt, and ſurrounded with ſoft parts, and are therefore unfit for vibrations, as indeed they are for ſuch as are made on the ſtrings of a muſical inſtrument; but the minuteſt vibrations, ſuch as they cannot be without, may be as ſufficient for this end, as the impulſe of light upon the Retina, is for the ſenſe of ſeeing. So that for ought that I can diſcern, ſenſations may be conveyed either, or both ways, tho' the advocates for each opinion, have chiefly inſiſted upon the improbability or impoſſibility of the other opinion.

TABLE XIV.

1. The Pericardium covering the heart.
2, 2. The lungs.
3. The gland Thymus.
4. The diaphragm.
5. The liver.
6. The ſtomach.
7, 7. The ſmall guts.

TAB. XIIII



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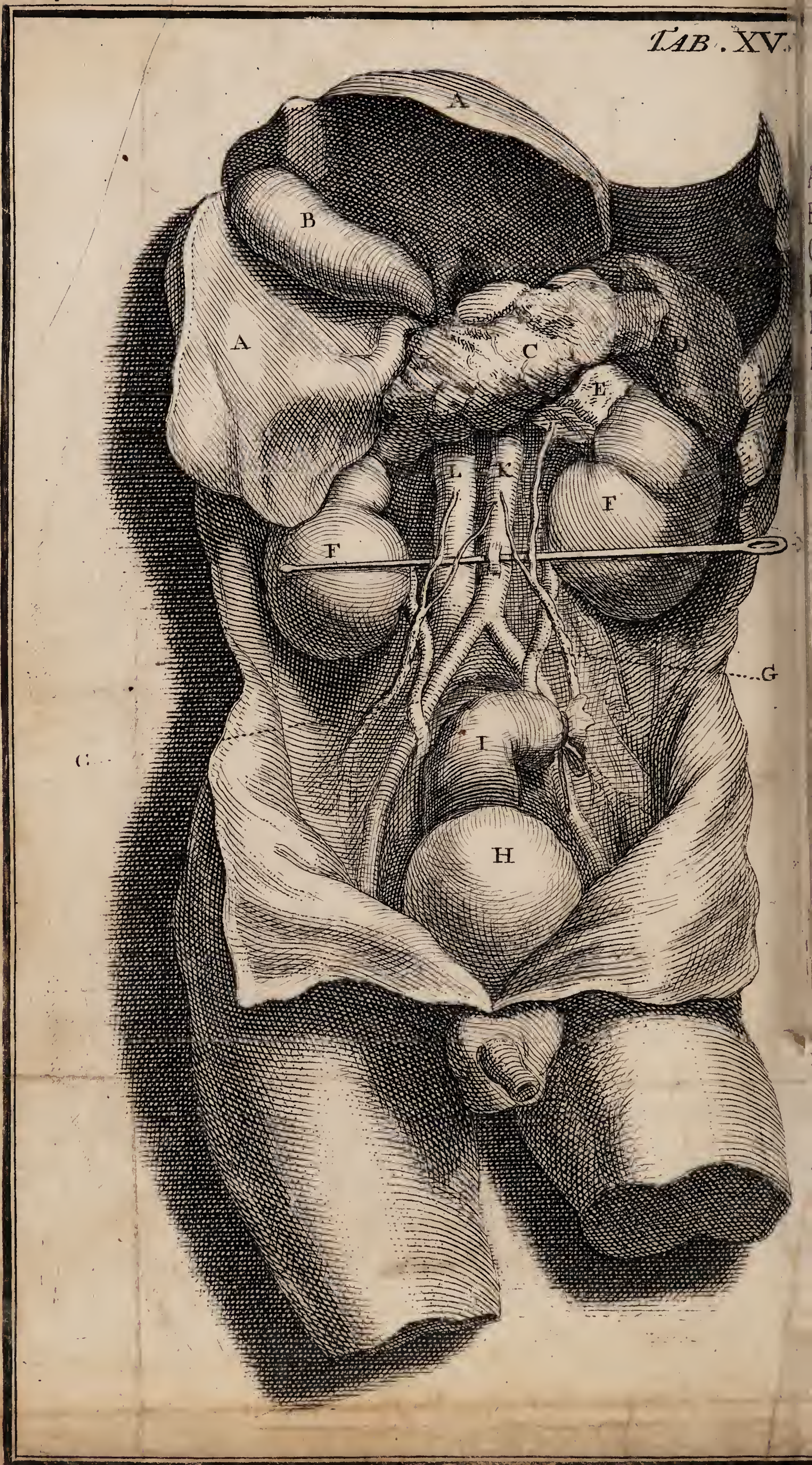
TAB. XV.



V.dr Gucht

TABLE XV.

A, The liver.
B, The gall-bladder.
C, The Pancreas.
D, The ſpleen.
E, One of the renal glands.
F, F, The kidneys.
G, G, The ureters.
H, The bladder of urine diſtended.
I, The Rectum Inteſtinum.
K, The Aorta.
L, The Vena Cava.
M, The four ſpermatick veſſels, with the Arteria Meſenterica Inferior, raiſed over a probe; the middle one the Arteria Meſenterica Inferior; the two next the ſpermatick arteries ariſing from the Aorta; the outmoſt the ſpermatick veins, the right ending in the Cava, the left in the left emulgent vein.

TABLE XVI.

The veſſels of the brain filled with wax.

1, 1. The carotid artery.

2, 2. The cervical artery.

3, 3, &c. The branches of the carotid artery which paſſes between the lobes of the brain on the left ſide.

4, 4, 4. The branches from the carotid artery which paſs between the hemiſpheres of the brain.

5, 5. The branches from the cervical artery, which are beſtowed upon the Cerebellum.

6. The ſuperior longitudinal Sinus.

7. The inferior longitudinal Sinus.

8. The ſtrait Sinus.

9. The lateral Sinus.

10. The circular Sinus.

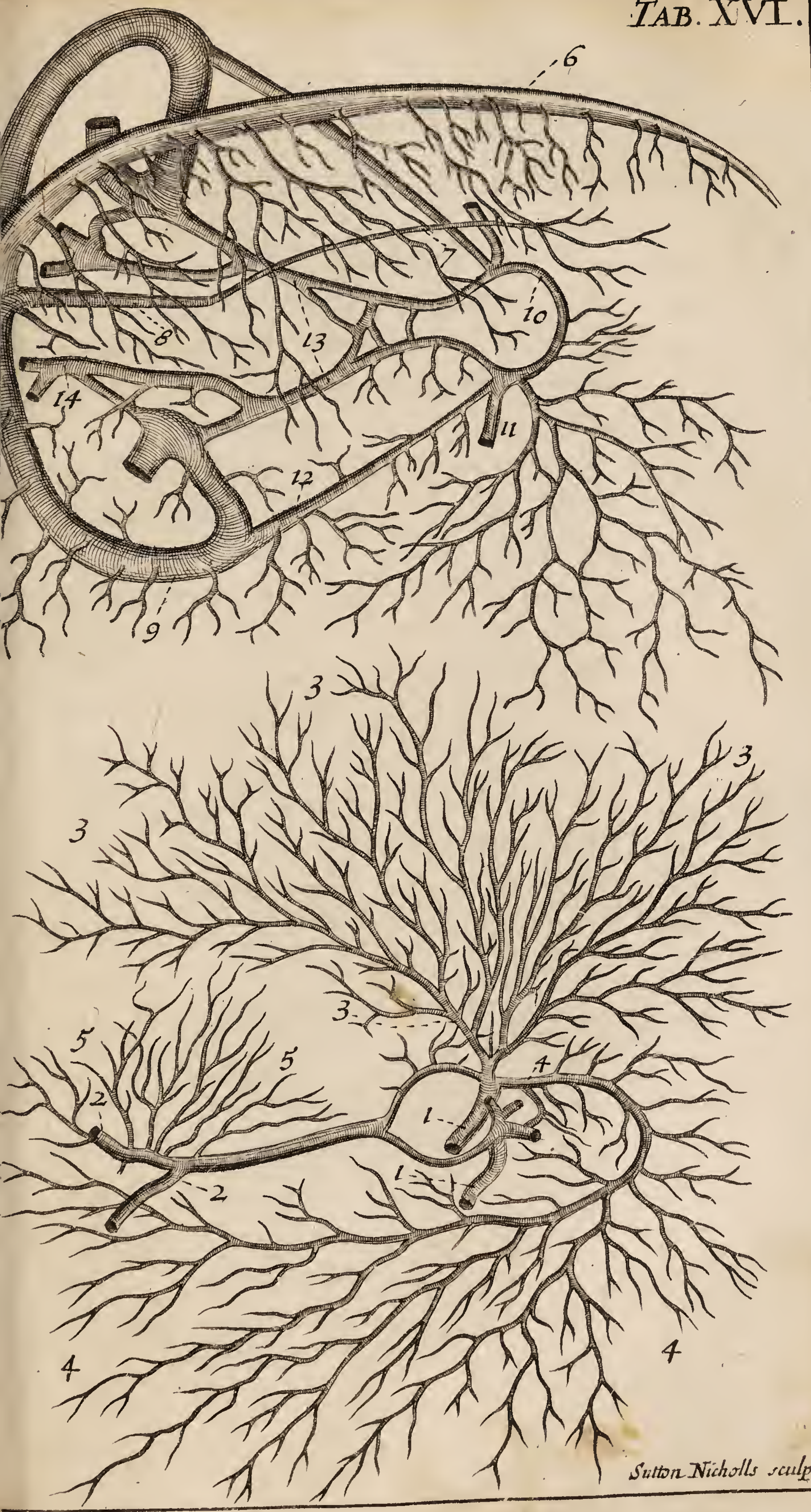
11. A vein from the circular Sinus.

12. A Sinus at the upper edge of the Os Petroſum.

13. A Sinus at the lower edge of the Os Petroſum.

14. The cervical Sinus.

TAB. XVI.



Sutton Nicholls sculp:

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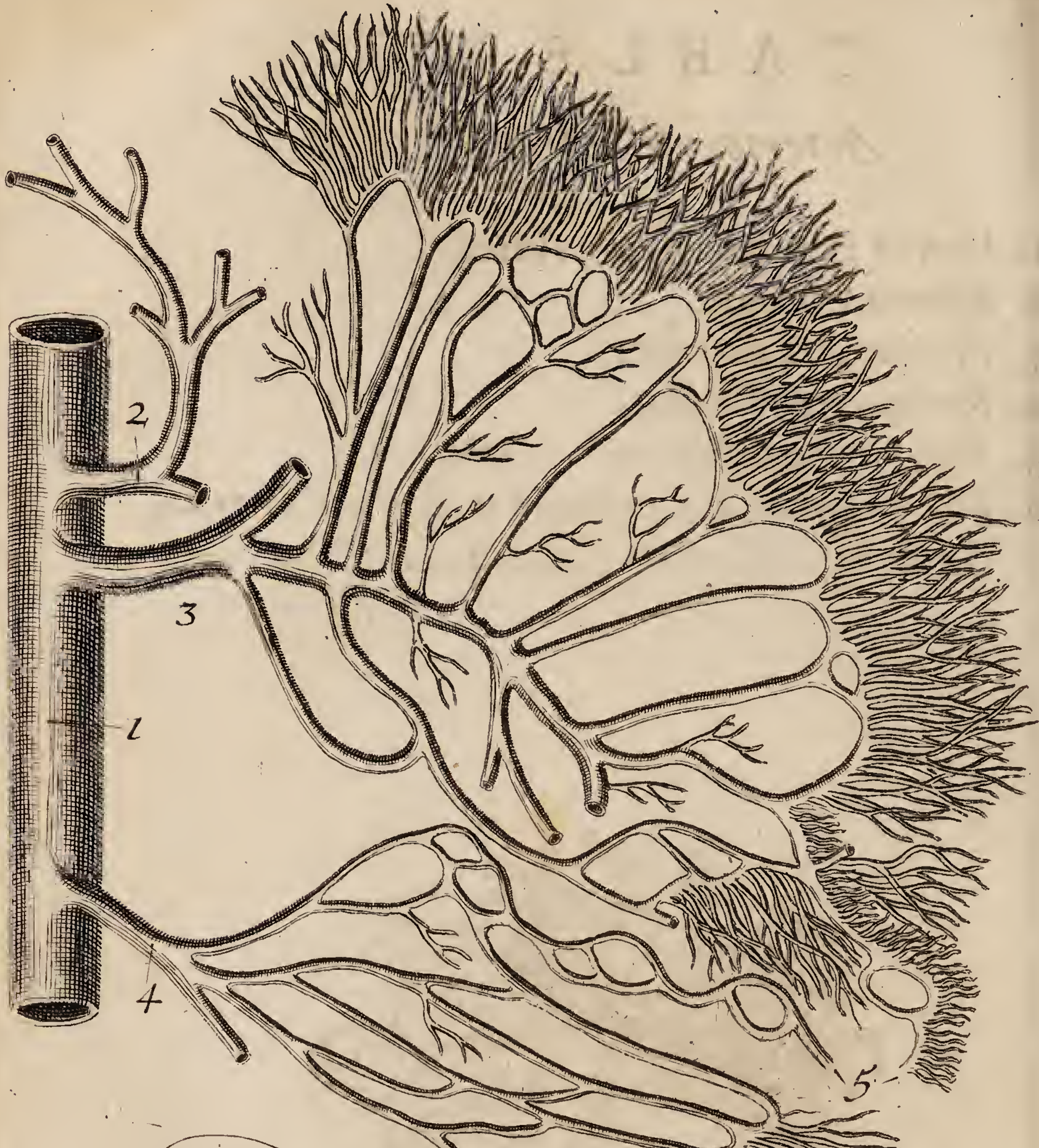
TAB. XVIII



Sutton Nicholls sculp:

TABLE XVII.

Arteries filled with wax.

1. Part of the deſcending Aorta.
2. Arteria Cœliaca.
3. Meſenterica Superior.
4. Meſenterica Inferior.
5. Part of the communicant artery.
6. Shews one of the extreme meſenteric arteries, as it is diſtributed round the inteſtine.

TABLE XVIII.

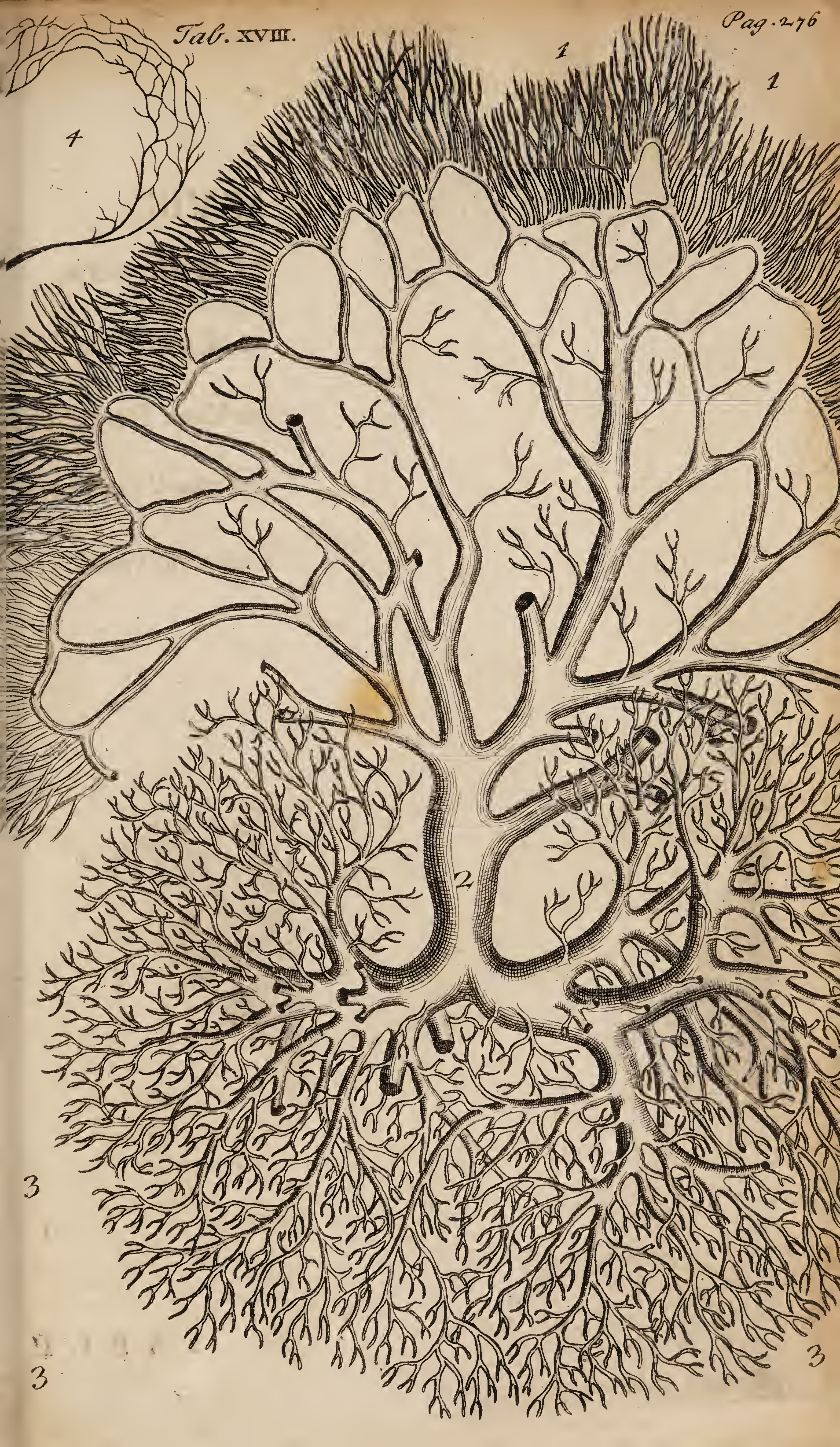
The Vena Portæ filled with wax.

1, 1, 1. THE extreme branches of the Vena Portæ in the Meſentery.

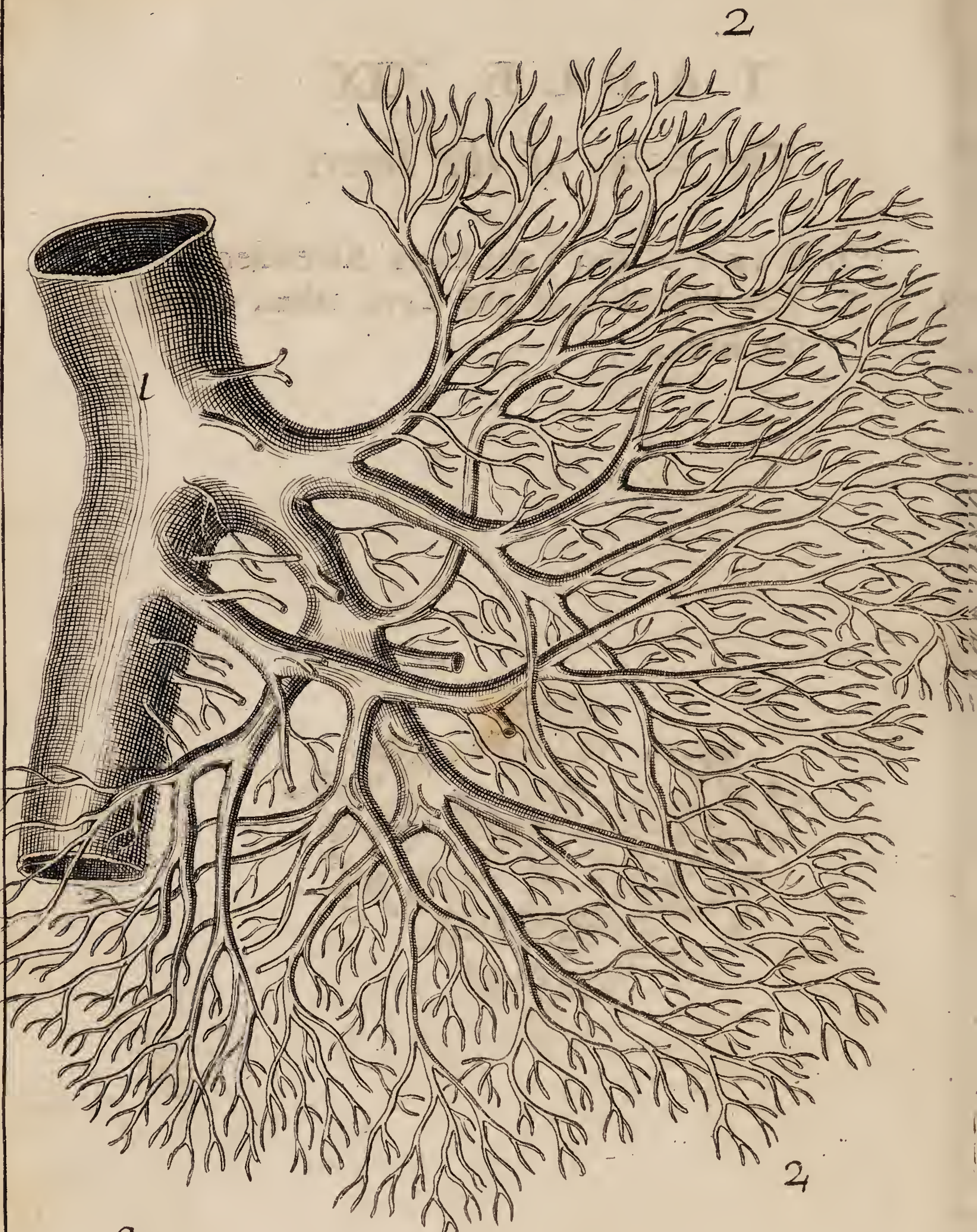
2. The ſingle trunk of the Vena Portæ entering the liver.

3, 3, 3. The extreme branches of the Vena Portæ in the liver.

4. One of the extreme meſenteric veins.


1
1
4
2
3
3
3

TAB. XIX



Sutton Nicholls sculp.

TABLE XIX.

The veins of the liver.

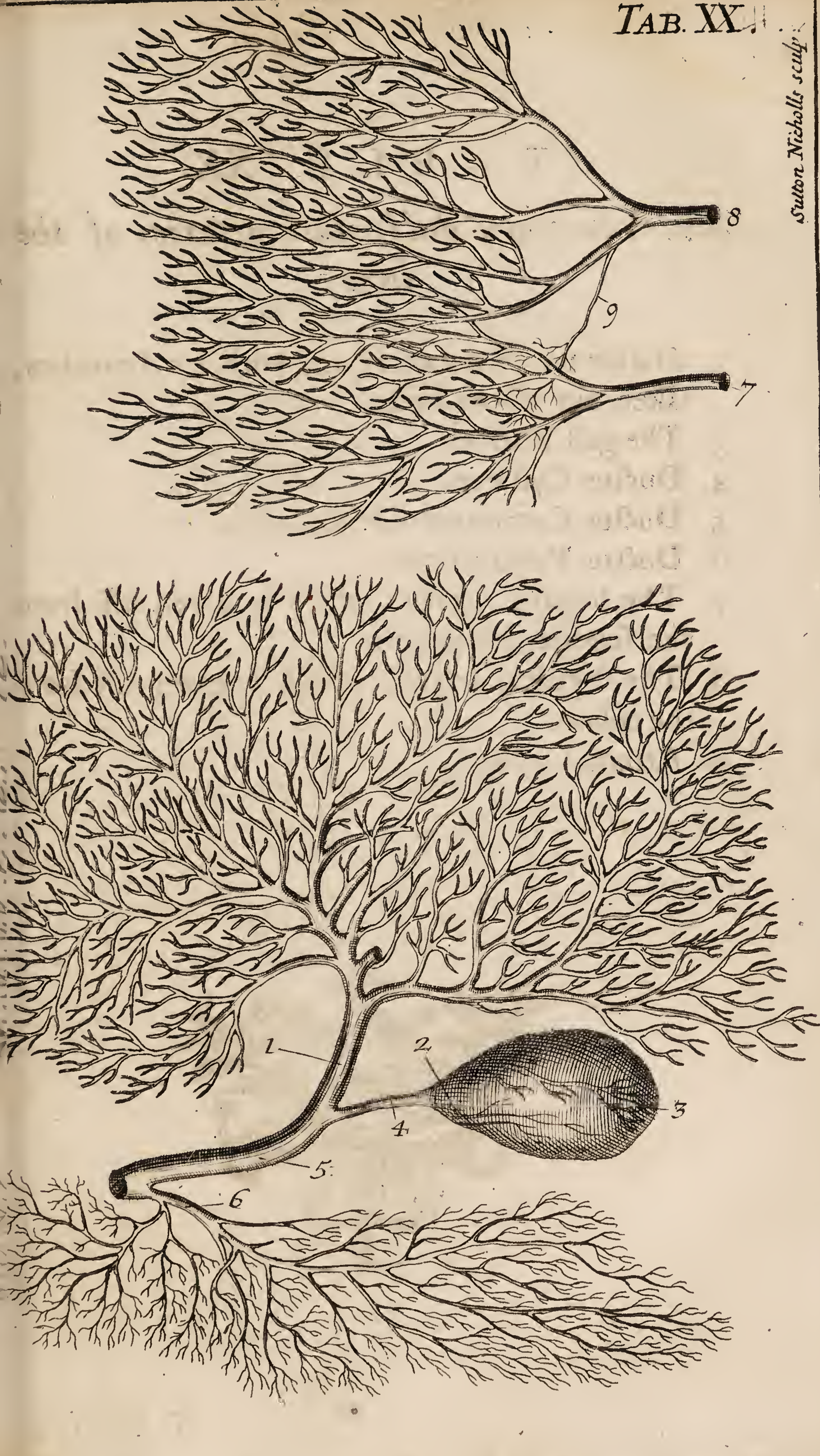
1. PART of the Vena Cava Aſcendens.
2, 2, 2. The branches of the Cava taken out of the liver.

TABLE XX.

The excretory ducts and arteries of the liver.

1. **Ductus Hepaticus**, with its branches, taken out of the liver.
3. The gall-bladder.
4. Ductus Cyſticus.
5. Ductus Communis Choledochus.
6. Ductus Pancreaticus.
7. The hepatic artery, which is given off from the ſuperior meſenteric.
8. The hepatic artery, which is given off from the celiac.
9. Arteria Cyſtica.

TAB. XX.



Sutton Nicholls sculp.

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TAB. XX

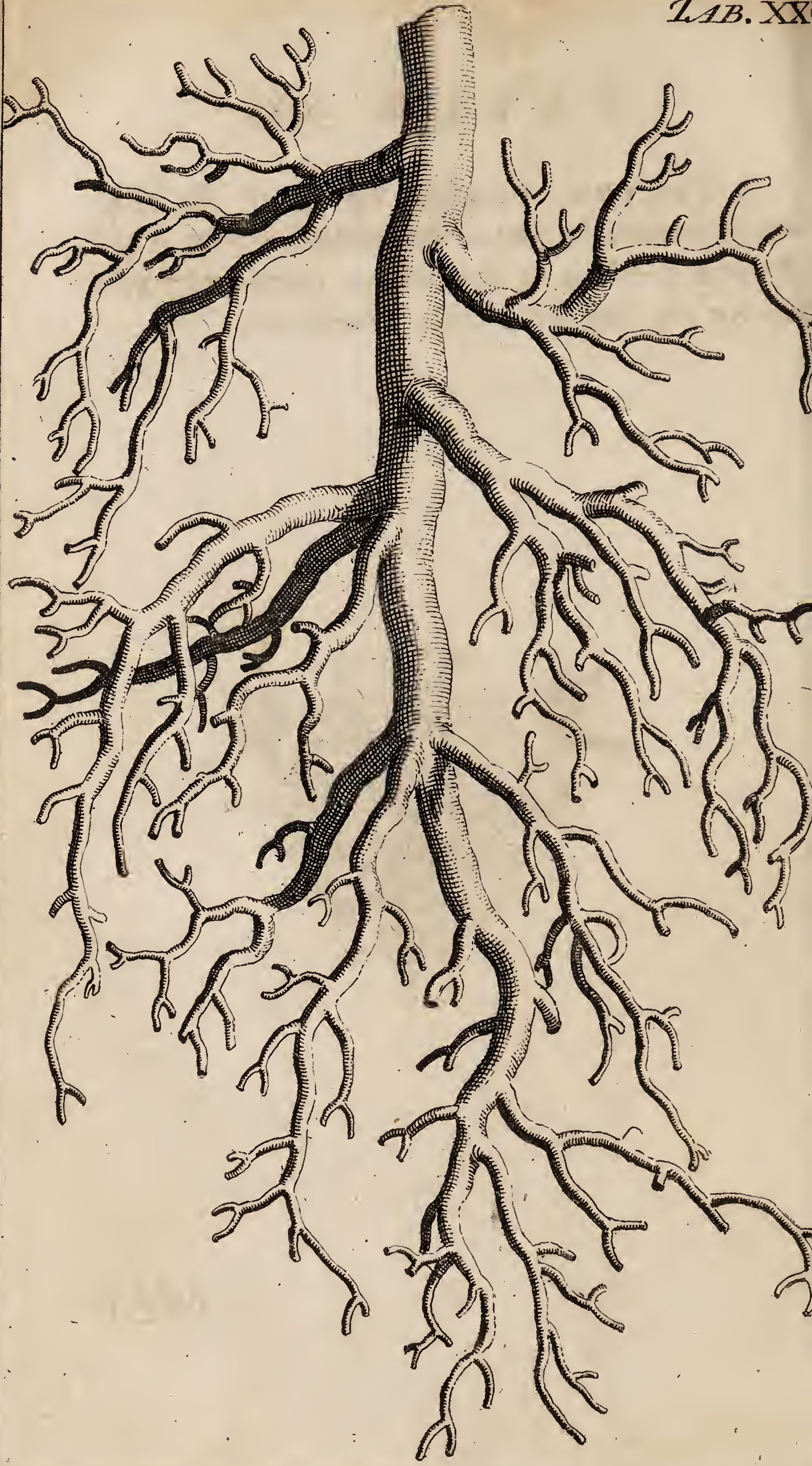


TABLE XXI.

A Polypus coughed up out of the lungs, which admirably ſhews the manner of the Aſpera Arteria dividing in the lungs; communicated to me by the late Dr. Oliver Horſeman.

TABLE XXII.

FIGURE 1

SHEWS the circulation of the blood, in the tail of a greg, from Mr. Cowper.

A, A, A, Where the extremities of the arteries and veins communicate.

B, B, B, B, Several other communications.

FIGURE 2

SHEWS the circulation of the blood, in the tail of a gudgeon.

A, A, A, The large veſſels.

B, B, B, The extremities of arteries communicating with the veins.

C, C, Some ſmall veſſels whoſe extremities could not be ſeen for the thickneſs of the tail.

TAB. XXII.

Fig. I.

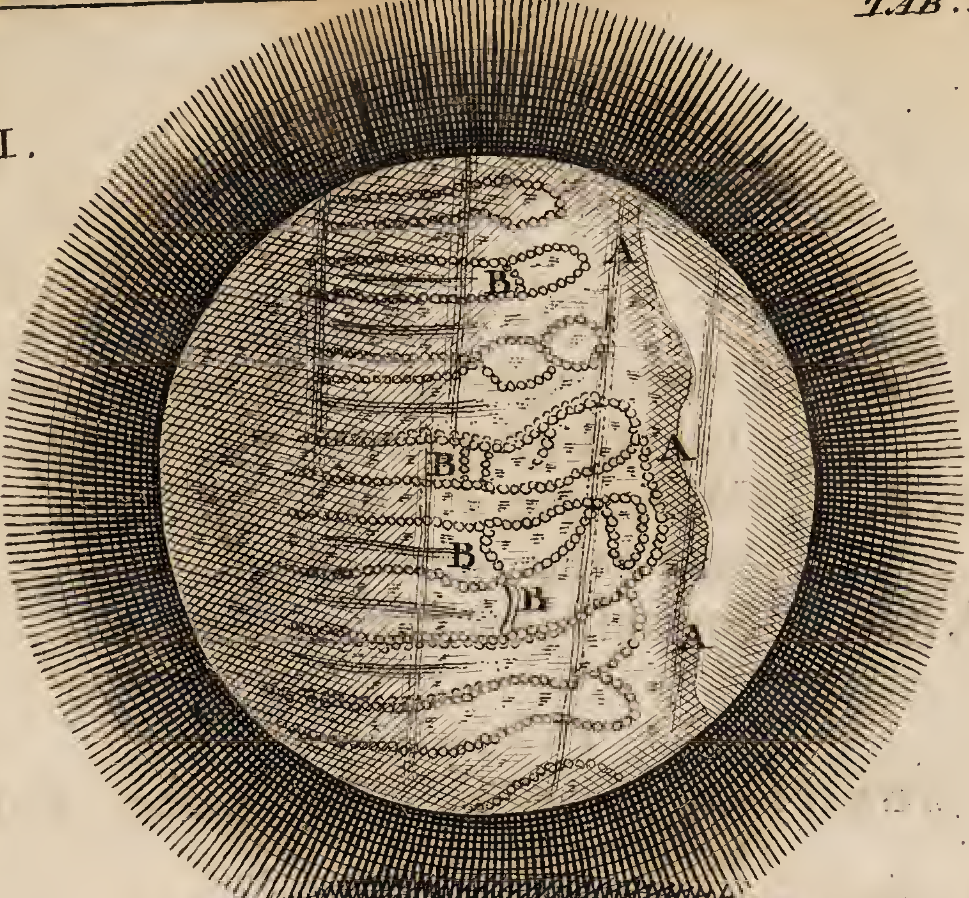
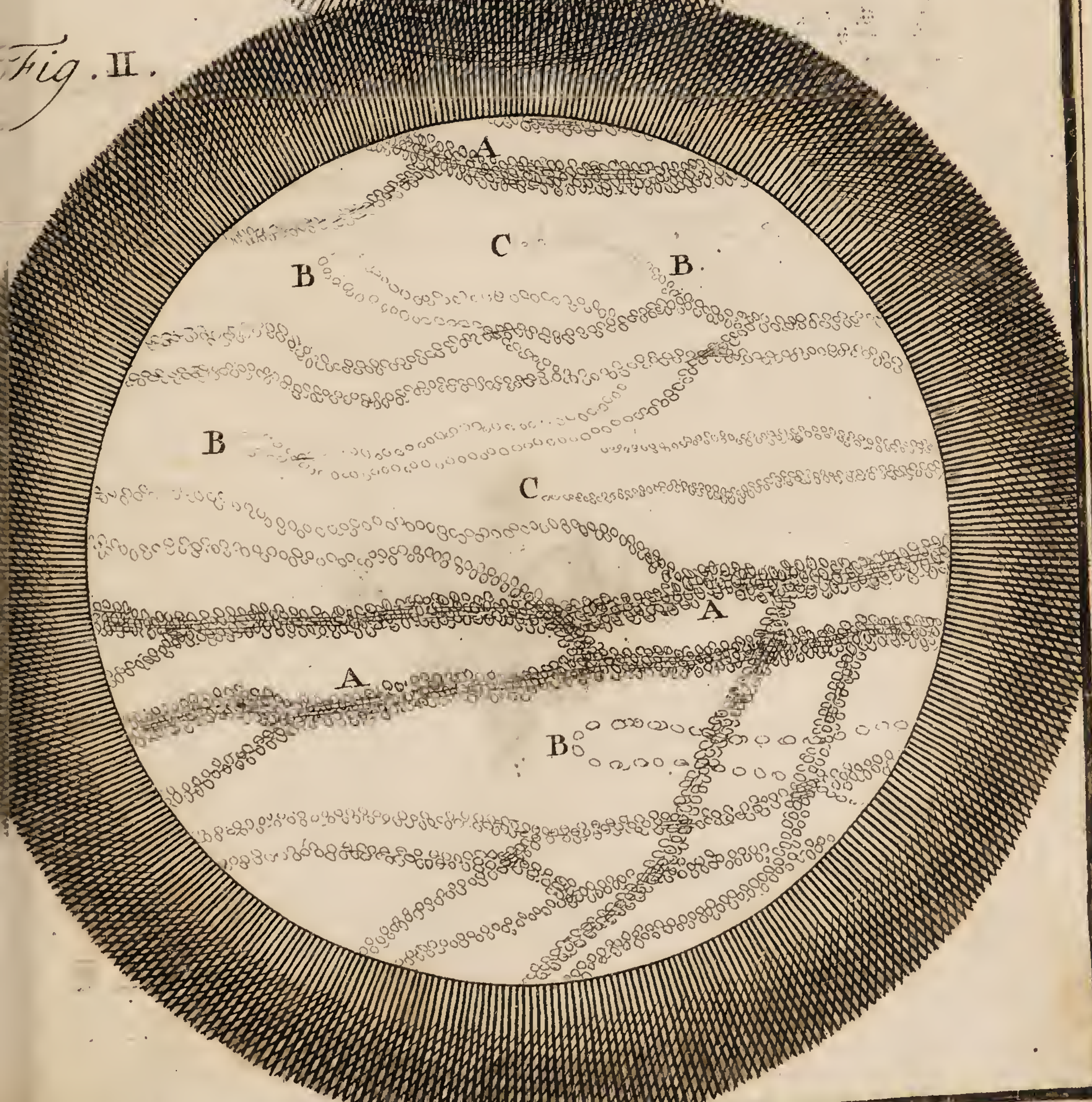


Fig. II.



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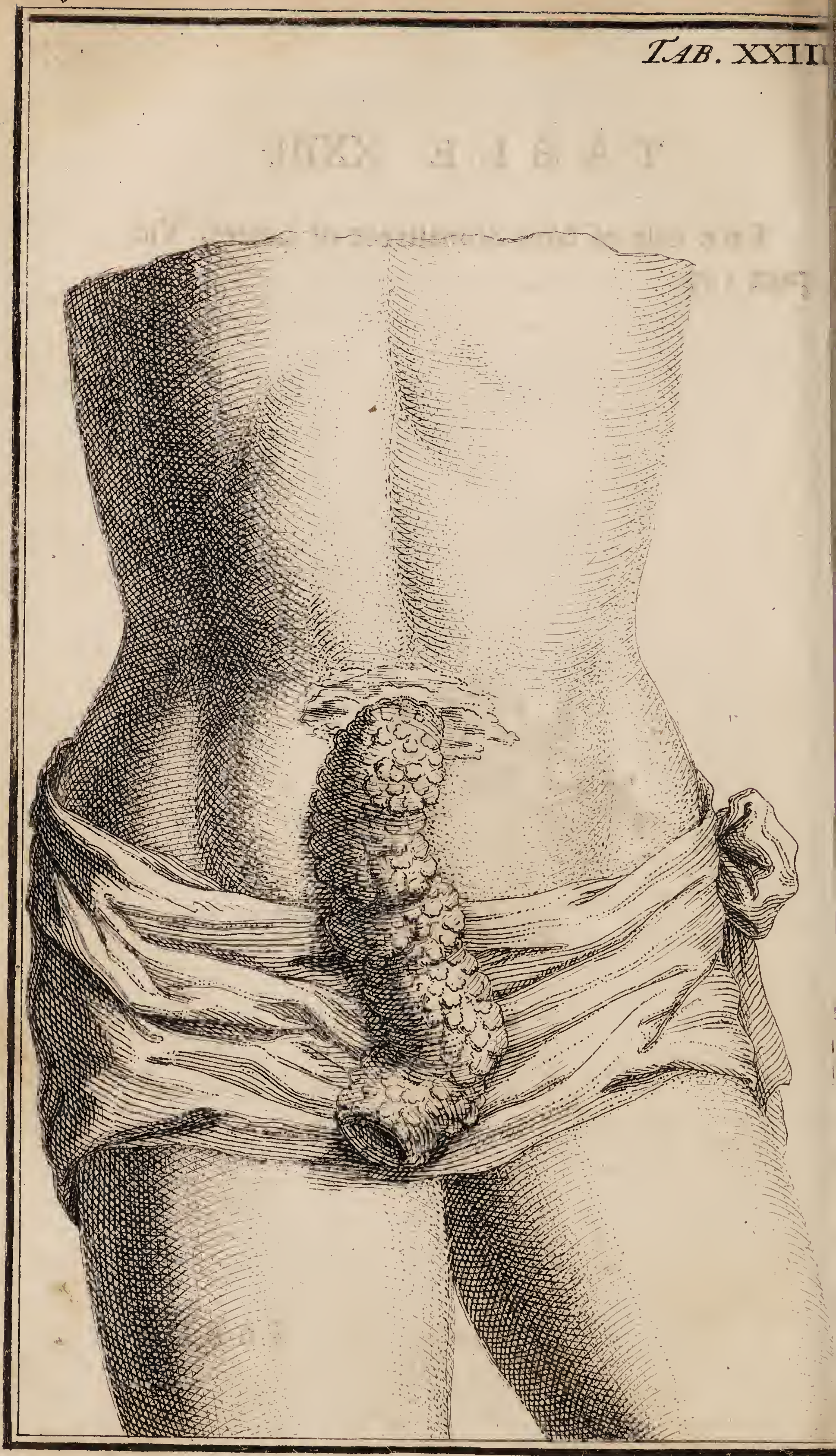
TAB. XXIII



V.dr Gucht Scu

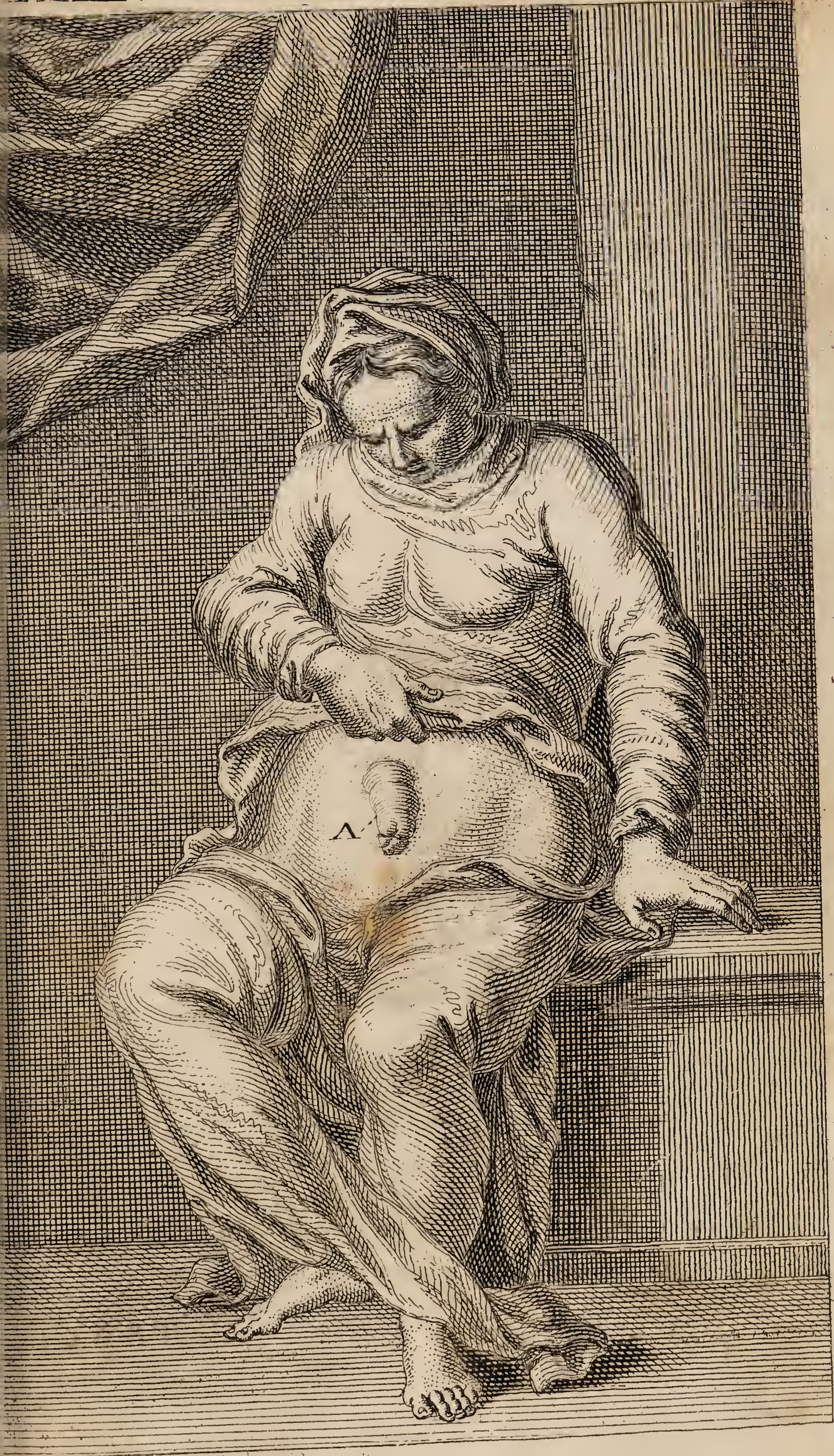
TABLE XXIII.

THE caſe of Mrs. Stoneſtreet of Lewes, Vid. page 149.

TABLE XXIV.

REPRESENTS the caſe of Margaret White, mentioned page 150.

A, The gut hanging out at the navel.


A

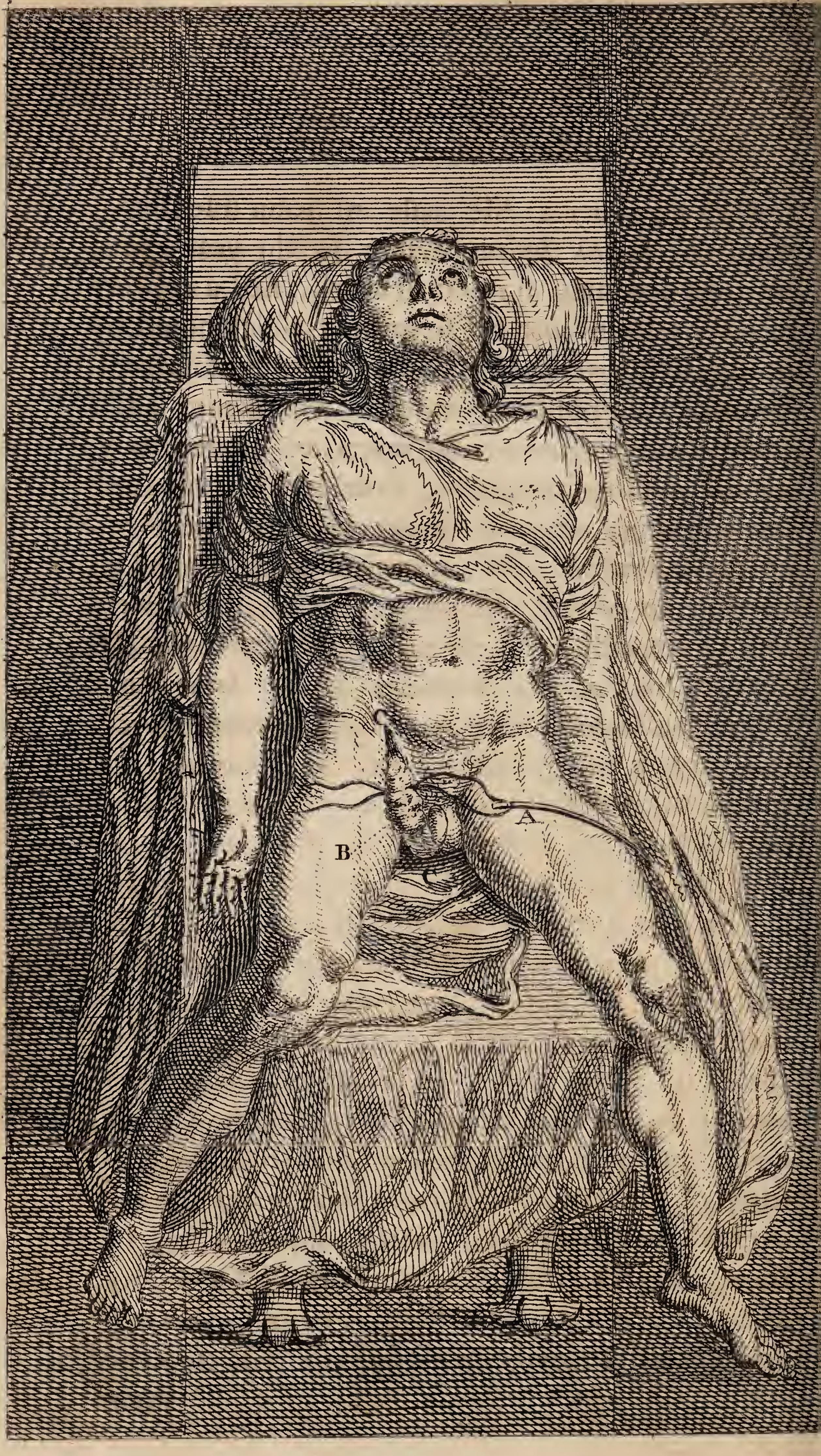
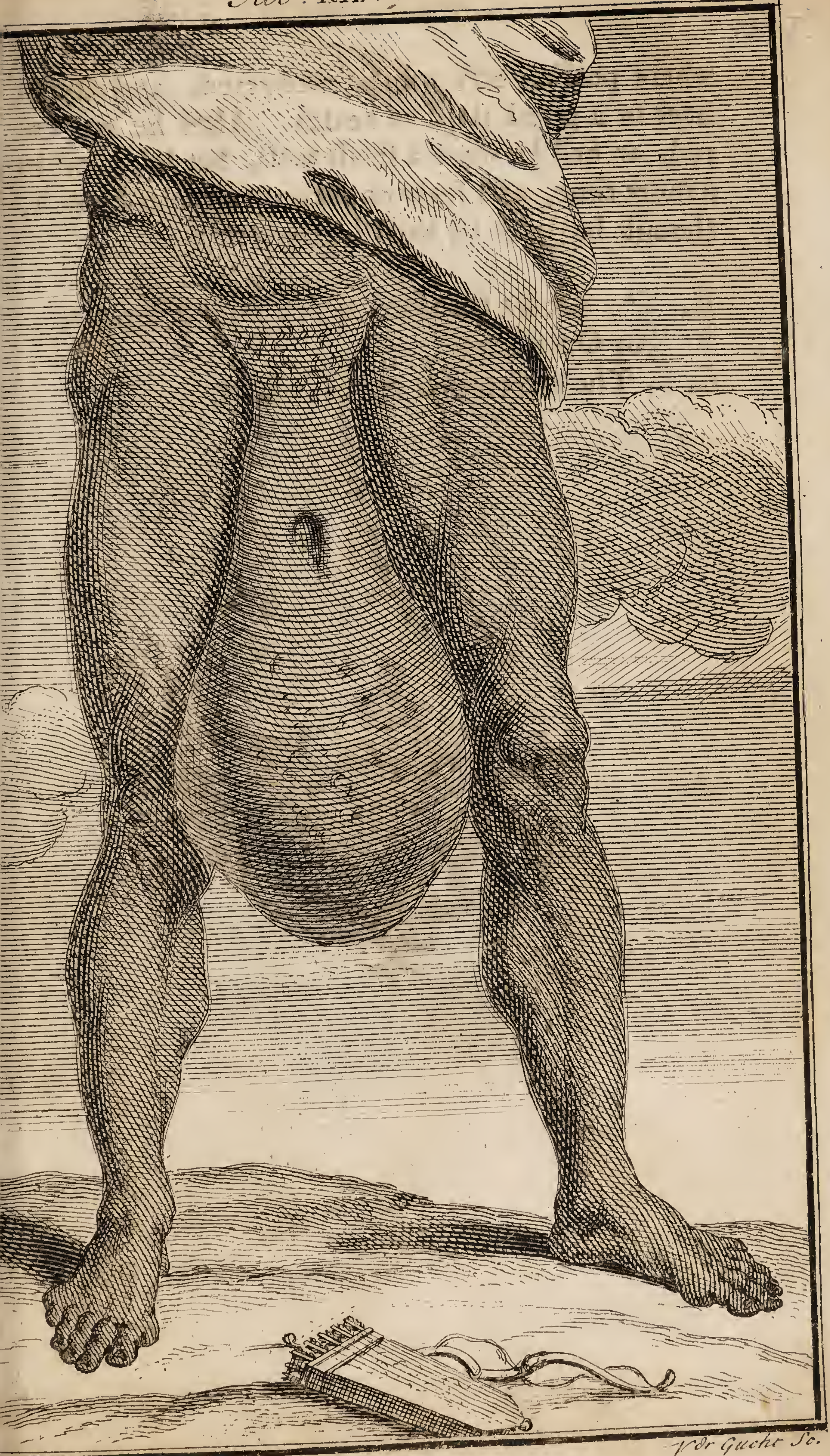

A
B
C

TABLE XXV.

REPRESENTS the caſe of John Heyſham, who, the friday before Eaſter in the year 1721, by over-ſtraining himſelf at work, had a rupture of his inteſtines into his Scrotum, which could by no means be reduced. He was brought into St. Thomas's hoſpital the monday following, and I would have performed the operation immediately, but he refuſing to ſubmit, I deferred it till tueſday morning, when he being willing, I performed the operation, and making a large wound in the bottom of the Abdomen, the inteſtines were eaſily reduced, and near a quart of water was diſcharged out of the Scrotum at the ſame time. There had been a rupture of the Omentum before, and it being united to the Scrotum and ſpermatic veſſels, I paſſed a needle, with a double ligature (as is expreſſed in the plate) under that part of the Omentum that adhered, ſo as not to hurt the ſpermatic veſſels; then cutting out the needle, I tied one of the ſtrings over the upper part of the Omentum, and the other over the lower, and then cut off as much of it as was in the way. My reaſon for tying in this manner was to ſecure the blood-veſſels, which, I think, could not be done ſo well with one ligature, becauſe of the largeneſs of the adheſion and the texture of the Omentum, which renders it too liable to be torn by ſuch a bandage. Three days after the operation an Eriſipylas begun in his legs, and ſpread all over his body, the cuticle every where peeling off; yet he recovered, and continues in a good ſtate of health. After he was cured, at firſt he wore a ſmall truſs, but left it off in a ſhort time, and feels no inconveniencies from it, though he lives by hard labour.

A, The needle threaded with a double ligature.
B, The Omentum.
C, C, The extremities of the wound.

TABLE



V.dr Gucht Sc.

TABLE XXVI

THE lower parts of a negroe, whoſe Scrotum was ſwelled to this ſize from a kick (the ſpermatic veſſels being not at all thickened.) The greateſt length was twenty ſeven inches, and the greateſt horizontal circumference forty two inches. He was the late Mr. Dickenſon's patient in St. Thomas's hoſpital; the tumor was ſolid, without inflammation or pain, but what parts were affected we could not learn, he not ſtaying for the operation. At the dark place he could pull out his Penis, when the Scrotum was lifted up.

BOOK IV.

CHAP. I.

Of the urinary and genital parts of men, together with the Glandulæ Renales.

THE urinary parts are the kidneys with their veſſels and bladder of urine.

THE kidneys of men are like thoſe Tab. xv. F. Tab. xxvii. 5. of a hog, the two weigh about twelve ounces; they are ſeated towards the upper part of the loins upon the two laſt ribs, the right under the liver, and a little lower than the other, and the left under the ſpleen. Their uſe is to ſeparate the urine from the blood, which is brought thither for that purpoſe by the emulgent arteries; and what remains from the ſecretion, is returned by the emulgent veins, while the urine ſecreted is carried off through the ureters to the bladder.

THE ureters, are tubes about the bigneſs of Tab. xv. G, G. Tab. xxvii. 8. gooſe-quills; and about a foot long, they ariſe from the hollow ſide of the kidneys, and end in the bladder near its neck, running obliquely for the

Tab. xxvii. 22. the ſpace of an inch between its coats; which manner of entering, is to them as valves. (Vide page 167.) The beginning of the ureters in the kidneys, are the Tubuli Urinarii, which join Tab. xxvii. 11. from the Pelvis in each kidney. Between the Tubuli Urinarii, authors have remarked ſmall Tab. xxvii. 10. Papillæ; and the parts which diſtinguiſh themſelves by a clearer colour, they call Glandulæ.

Tab. xv. H. The bladder of urine, is ſeated in a duplicature of the Peritoneum in the lower part of the Pelvis in the Abdomen; its ſhape is orbicular, and its coats are the ſame with thoſe of the guts, and other hollow muſcles already deſcribed, viz. an external membranous, a middle muſcular, which is the Muſculus Detruſor Urinæ, and an inner membranous coat, exceeding ſenſible, as is fully ſhewn in the caſes of the ſtone and gravel. The uſe of this nice ſenſe is, to make it capable of that uneaſineſs which excites animals to exclude their water, when the bladder is much extended. Some anatomiſts, not thinking how ſoon fluids taken into the ſtomach, and not retained there, by being mixed with ſolids, may paſs into the blood, as the effects from drinking ſtrong liquors, or Laudanum, or drinking without eating when we are hot, ſufficiently ſhew; and alſo not conſidering the ſhortneſs of the courſe, from the ſtomach to the kidneys this way, together with the ſize of the emulgent arteries, and the velocity of the blood in them, have imagined and affirmed, that there muſt be ſome more immediate courſe from the ſtomach or guts to the bladder; and not conſidering either how ſuch a courſe would have interrupted one great end in the animal œconomy, or that veſſels fit to fill the bladder faſter than the ureters, muſt have been too large to be concealed.

GLANDULÆ RENALES, are two glands ſeated immediately above the kidneys, of no certain figure, nor do we know their uſe; but always paint and deſcribe them with the urinary parts becauſe of their ſituation: In a very young Fœtus they are larger than the kidneys, and in an adult but a little larger than in a Fœtus. They receive a great many ſmall arteries, and return each of them one or two veins. In their inſide is a ſmall Sinus tinctured with a ſooty coloured liquor. Tab. xv. E. Tab. xxvii. 7.

VALSALVA, in a diſcourſe before the academy of ſciences at Bologna, has given an account of a duct from theſe glands to the Epididymides in men, and the Ovaria in women, and undertook to prove that they are principal organs of generation, and promiſed to publiſh a treatiſe on this ſubject as ſoon as the cuts for it could be made; but being ſince dead, we do not yet know what was done towards it. Mr. Renby has ſearched very carefully to diſcover them, but in vain: However he has obſerved a ſmall artery, which dividing, ſends one branch into the renal gland, and the other into the Epididymis, which he thinks Valſalva has miſtaken for a duct.

THE genital parts of men are the Teſtes and Penis, with their veſſels, &c.

THE office of the Teſtes, is to ſeparate the ſeed from the blood; they are ſeated in the Scrotum, and are ſaid to have four coats, two common, and two proper. The common are the outer ſkin and a looſe membrane immediately underneath, called Dartos. The firſt of the proper, is the Proceſſus Vaginalis; it is continued from the Peritoneum to the teſticle, which it incloſes with all its veſſels, but is divided by a Septum, or an adheſion immediately above the teſticle, ſo that no liquor can paſs out of that part of this membrane which encloſes the ſpermatic veſſels into that which encloſes the teſticle. Large quantities of water are ſometimes found in theſe cavities, which diſeaſe is ſeldom cured without opening the cavity where the water is contained, as in ſinuous ulcers: But a true Hernia Aquoſa is a rupture through the Peritoneum from the Abdomen, which may be cured by a puncture; and in this caſe, as in the Hernia Inteſtinalis, and Omentalis, when once a cavity is ſtretched out, the inſide of it is ſoon formed into a ſtrong membrane like that of a Cyſtic tumour, and looks as if the Peritoneum it ſelf had been ſtretched down thither, and thickened. (Vid. Muſculi Abdominis.) The other proper coat, is the Albuginea, which is very ſtrong, immediately incloſing the teſticles. The teſticles of a rat may be unraveled into diſtinct veſſels, and the texture of the teſticles of all other animals appear to be the ſame, but their veſſels are too tender, or cohere too much to be ſo ſeparated. Tab. xxviii. A, B, D.

Tab. xv. M. Tab. xvvii. 12. THE teſticles, receive each, one artery from the Aorta, a little below the emulgents, which, unlike all other arteries, ariſe ſmall, and dilate in their progreſs, that the velocity of the blood may be ſufficiently abated for the ſecretion of ſo viſcid a fluid as the ſeed. The right teſticle returns its vein into the Cava, and the left into the emulgent vein on the ſame ſide; both becauſe it is the readieſt courſe, and becauſe, as authors ſay, this ſpermatic vein would have been obſtructed by the pulſe of the Aorta, if it had croſſed that veſſel to go to the Cava. Tab. xxvii. 13.

A GENTLEMAN whom I caſtrated, who truſted too much to his own reſolution, and refuſing to have any one preſent to hold him, except Mr. Geeke, who was my aſſiſtant; during the operation, moved ſo much, that the ligature which tied all the veſſels with the proceſs together, ſlipt, and only tied the proceſs over the ends of the veſſels; which being perceived ſoon after the operation, I cut the ligature, and took out the extravaſated blood, and tied the artery alone, which gave but little pain, and it digeſted off in a week's time; and the wound being afterwards ſtitched, though the teſticle weighed a pound, it was perfectly well in five weeks; which is in leſs time than the ligature often requires to be digeſted off, when the proceſs and all the veſſels are tied together. However if this caſe is not ſufficient to recommend doing this operation by tying the artery only, it may be ſufficient to recommend extraordinary care in doing of it the uſual way, for if the blood had found an eaſy paſſage into the Abdomen, the patient might have bled to death without our knowledge.

Tab. xxvii. 17. On the upper part of the teſticles, are hard bodies called Epididymi; which are evidently the beginnings of the Vaſa Deferentia. I have unravelled them backward, in ſingle veſſels, and then into more and ſmaller, like the excretory veſſels of other glands.

Tab. xxvii. 18. Vasa Deferentia, are excretory ducts to carry the elaborated ſeed to the Veſiculæ Seminales. They paſs from the Epididymi of the teſticles, together with the blood-veſſels, till they have entered the muſcles of the Abdomen, and then they paſs under the Peritoneum, directly through the Pelvis, to the Veſiculæ Seminales.

Tab. xxvii. 19. Vesiculæ Seminales, are two bodies that appear like veſicles; they are ſeated under the bladder of urine, near its neck; they may be each of them eaſily unravelled into one ſingle duct, which diſcharge into the Urethra, by the ſides of the Roſtrum Gallinaginis, which is an eminence in the under ſide of the Urethra, near the neck of the bladder. Tab. xxvii. 21. In theſe veſicles or ducts the ſeed is repoſited againſt the time of coition; but in dogs there are no ſuch veſicles, therefore nature has contrived a large bulb in their Penis, which keeps them coupled, ſeemingly againſt their inclinations, till the ſeed can arrive from the teſticles. The ſeed paſſes from theſe veſicles in men, and even from the Vaſa Deferentia, in time of coition, through the proſtrate glands into the Urethra, as in thoſe animals that have no Veſiculæ Seminales; for when the ducts into the Urethra are diſtended, that is the direct-eſt courſe from the Vaſa Deferentia, as well as from the Veſiculæ Seminales.

PROSTATÆ, are two glands, or rather one, Tab. xxvii. 20. about the ſize of a nutmeg: They are ſeated between the Veſiculæ Seminales and Penis, under the Oſſa Pubis, almoſt within the Pelvis of the Abdomen. They ſeparate a lympid glutinous humour, which is carried into the Urethra by ſeveral ducts, which enter near thoſe of the Proſtatæ; this liquor ſeems to be deſigned to be mixed with the ſeed in the Urethra, in the time of coition, to make it flow more eaſily.

PENIS, its ſhape, ſituation and uſe, need no deſcription. It begins with two bodies, named Crura, from the Oſſa Iſchia, which unite under the Oſſa Pubis, and are there ſtrongly connected by a ligament. In its under part is a channel from the bladder, called Urethra, through which both the urine and ſeed paſs; its fore-part is called Glans, the looſe ſkin which covers it, Præputium, and the ſtrait part of that ſkin on the under ſide, Frœnum.

THE Urethra, is lined with a membrane filled with ſmall glands, that ſeparate a Mucus, that defends it from the acrimony of the urine. Theſe glands are largeſt neareſt the bladder. Mr. Cowper deſcribes three large glands of the Urethra, which he diſcovered; two of which are ſeated on the ſides of the Urethra, near the ends of the Crura Penis; to which he adds a third, leſs than the other, ſeated almoſt in the Urethra, a little nearer the Glans than the former. All theſe glands have excretory ducts into the Urethra.

Tab. xxvii. A, A. THE inner texture of the Penis is ſpongy, like the inner texture of the ſpleen, or the ends of the great bones. It is uſually diſtinguiſhed into Corpus Cavernoſum Penis, Glandis and Urethræ; the firſt of theſe makes part of the Glans, and is divided its whole length by a Septum; the other two are compoſed of ſmaller cells, and are but one body. On the upper ſide of the Penis, are two arteries, and one vein called Vena Ipſius Penis. The arteries are derived from the beginnings of the umbilical arteries, which parts never dry up, and the vein runs back to the iliac veins. The Vena Ipſius Penis, being obſtructed, the blood that comes by the arteries, diſtends the cells of the whole Penis, and makes it erect; but to prevent any miſchief from this mechaniſm, there are ſmall collateral veins on the ſurface of the Penis, that carry back ſome blood all the time the Penis is erect. By what power the Vena Ipſius Penis is obſtructed to erect the Penis, I cannot conceive, unleſs ſmall muſcular fibres conſtrict it. Moſt authors think the Muſculi Erectores Penis do it, by thruſting the Penis againſt the Os Pubis; but they are not ſeated, as Mr. Cowper obſerves, conveniently for ſuch an office; beſides, if a preſſure from the lower ſide of the Penis is ſufficient, an artificial preſſure, which may be much greater, ſhould, I think, produce the ſame effect. When the matter of a gonorrhea is ſo virulent as to make ulcers in the Urethra, when thoſe ulcers cicatriſe they conſtrict the Urethra, and make that difficulty in the waters paſſing, which is vulgarly thought to proceed from caruncles.

Tab. xxviii. E.

In the ſeed of men, and of many other male animals, Lewenhoeck, by the help of microſcopes, diſcovered an infinite number of animals like tadpoles, which he and others ſuppoſe to be men in miniature, and that one of theſe being entered into an egg in one of the Ovaria, (See the next chapter.) conception is performed. But though ſcarce any one, that has made due enquiry, has ever doubted of the exiſtence of theſe animals, yet there are many who object againſt this hypotheſis; and though I am inclined to think it tiue, yet I will endeavour impartially, to lay down the principal objections and anſwers, that the reader may judge for himſelf. The firſt and ſtrongeſt objection, is raiſed from the ſeveral inſtances that have happened of mixed generation, where the animal produced always appears to partake of both kinds, as in the common caſe of a mule, which is begot by an aſs upon a mare; when according to that hypotheſis, they expect the animal produced from mixed generation, ſhould be entirely of the ſame ſpecies with the male animal; as the ſeeds of plants, whatever earth they grow in, always produce plants of the ſame kind; nevertheleſs if we conſider what influence womens fears or longings, frequently have upon their children in Utero, and how great a change caſtration makes in the ſhape of any animal, and that a lamb ſuckled by a goat (if I have been rightly informed) grows hairy like a goat, we cannot then wonder if the mothers blood, to which the animal owes its nouriſhment and increaſe, from the time of impregnation to the time of its birth, ſhould be thought a ſufficient cauſe of reſemblance between theſe animals and their mothers. Another objection is, that nature ſhould provide ſuch a multiplicity of theſe animals, when ſo few can ever be of uſe, an animal being to be generated of one only. To which it has been anſwered, that in all plants a vaſt number of ſeeds are found, though a very few of the whole that are produced, fall into the earth, and produce plants; and as in plants the greateſt part of their ſeeds are the food of animals, ſo the greateſt part of the Animalculæ, may as well live a time to enjoy their own exiſtence, as any other animal of as low an order. The laſt objection is their ſhape, which I think, will appear to have no weight, when we conſider how the eggs of flies produce maggots, which grow up into flies; and the tadpole produced from the egg of a frog, grows into a form as different from a tadpole as the form of a man: And if theſe animals had produced ſo few at a time, as that their young might have undergone this change in Utero, it is highly probable, that we ſhould not ſo much as have ſuſpected theſe analogous changes. But how the Animalculæ themſelves are produced, is a difficult queſtion, unleſs by equivocal generation, ſeeing none of them appear to be in a ſtate of encreaſe, but all of a ſize.

In a boy that died of the ſtone, I found a double Ureter, each part being dilated to an inch diameter; the Pelvis in each kidney to twice its natural bigneſs, and the Tubuli Urinarii, each as large as the Pelvis.

In a man that had never been cut for the ſtone, I found the Ureters dilated in ſome places to four inches circumference, and in others but little dilated, and a ſtone that I found in the bladder was leſs than a nutmeg, which muſt have fallen in ſeveral pieces, or both ureters could not have been dilated. From this, and other like obſervations, I think it appears that the prodigious ſize to which the ureters are uſually extended, in people who are troubled with the ſtone, is owing to ſmall ſtones which ſtick at the entrance into the bladder, until the obſtructed urine which dilates the ureters, can force them into the bladder.

I have once met with a kidney almoſt conſumed, and lymphatics in a diſeaſed teſticle, as large as a crow-quil.

CHAP. II.

Of the genital parts of women.

THE external parts, are the Mons Veneris, which is that riſing of fat covered with hair above the Rima Magna upon the Os Pubis, the great doubling of the ſkin on each ſide the Rima called Labia, and within theſe a leſſer double named Nymphæ. Theſe help to cloſe up the orifice of the Vagina: The Nymphæ are uſually ſaid to ſerve to defend the Labia from the urine; but I do not ſee how the Labia ſtand more in Tab.xxix. 1. Tab.xxix. 2.

need of ſuch a defence, than the Nymphæ themſelves.

Clitoris, is a ſmall ſpongy body bearing ſome analogy to the Penis in men, but has no Urethra. It begins with two Crura from the Oſſa Iſchia, which uniting under the Oſſa Pubis, it proceeds to the upper part of the Nymphæ, where it ends under a ſmall doubling of ſkin, called Tab.xxix. 3. Preputium; and the end which is thus covered is called Glans. Tab.xxix 4. This is ſaid to be the chief ſeat of pleaſure in coition in women, as the Glans is in men.

A little lower than this, juſt within the Vagina, is the exit of the Meatus Urinarius.

Tab.xxix. 6. Vagina, is ſeated between the bladder of urine and the Inteſtinum Rectum. The texture of it is membranous, and its orifice is contracted with a Sphincter (Vid. Muſc. Sphincter Vaginæ;) but the farther part is capacious enough to contain the Penis without dilating. Near the beginning of the Vagina, immediately behind the orifice of the Meatus Urinarius, is conſtantly found in children, a valve called Hymen, which looking towards the orifice of the Vagina, cloſes it in the ſame manner that the valves of the ventricles of the heart, cloſe the entrance of the ventricles; but as children grow up, and the Sphincter Vaginæ grows more uſeful, this valve is proportionably ſmaller, and in women very rarely to be found, only ſome ſmall parts appearing in the place of this valve called Carunculæ Myrtiformes. There have been a few inſtances in which the edges of this growing together, it continued unperforate, until it has been neceſſary to make an inciſion to let out the Menſes. The inner part of the Vagina is formed into Rugæ, which are largeſt in thoſe who have not uſed copulation; and leaſt in thoſe who have had many children. Under theſe Rugæ are ſmall glands, whoſe excretory ducts are called Lacunæ: Theſe glands ſeparate a mucilaginous matter to lubricate the Vagina, eſpecially in coition; and are the ſeat of a Gonorrhea in this ſex, as the glands in the Urethra are in the male.

UTERUS, is ſeated at the end of the Vagina; Tab xxix. 8. it is about one inch thick, two broad, and large enough to contain the kernel of a hazel nut; but in women that have had children a little larger. Its orifice into the Vagina, is called Os Tincæ, Tab.xxix. 7. from the reſemblance it bears to a tench's mouth. It has two round ligaments which go Tab.xxix. 12. from the ſides of it to the groins through the oblique and tranſverſe muſcles of the Abdomen, in the ſame manner as to the ſeminal veſſels in men. This way the gut paſſes in a Hernia Inteſtinalis in women, (Vid. Muſculi Abdominis.) Some authors mention Ligamenta Lata, which are nothing but a part of the Peritoneum. Near the ſides of the Uterus lie two bodies called Ovaria, they are Tab.xxix. 11. of a depreſſed oval figure about the ſize of men's teſticles, and have ſpermatic veſſels; they contain ſmall pellucid eggs, from which they have their name. There are two arteries and two veins which paſs to and from the ovaries or teſtes, in the ſame manner that they do in men; but make more windings, and the arteries dilate more ſuddenly,

denly, in proportion as they are ſhorter. Theſe arteries and veins detach branches into the Uterus and Fallopian tubes, and not only make communication betwixt the artery and vein on one ſide and thoſe of the other, but alſo with the proper veſſels of the Uterus detached from the internal iliac arteries and veins. From theſe veſſels both arteries and veins in the inſide of the Uterus, the menſtrual purgations are made in women, and ſomething of the ſame kind in brutes, as often as they deſire coition. One uſe of theſe purgations is, to open the veſſels of the Uterus, for the veſſels of the Placenta to join to them. Many authors have imagined that there muſt be ſome evacuations analagous to this, in men, which I cannot ſee the neceſſity of; but on the contrary, I believe that men's not having ſuch evacuations, is the true reaſon why their bodies grow larger and ſtronger than womens; and their continuing to grow longer before they are fit for marriage, I alſo take to be the true reaſon why there are more males born than females, in about the proportion of thirteen to twelve; for women being ſooner fit for marriage than men, fewer will die before that time, than of men.

Tab.xxix. 9. NEAR the ſides of the Ovaria, are ſeated the Tubæ Fallopianæ, one end of which is connected to the Uterus, and the ſide to the Ovarium Tab.xxix. 10. by a membrane, the other end being jagged, is called Morſus Diaboli. Among theſe jaggs is a ſmall orifice which leads into the tube, which near this end is about a quarter of an inch diameter, and thence growing gradually ſmaller paſſes to the Uterus, and enters there with an orifice about the ſize of a hog's briſtle. The uſe of theſe tubes is to convey the male ſeed from the Uterus to the Ovaria, to impregnate the eggs for conceptions; yet they are ſeemingly ſo ill adapted to this end, that many writers have ſuppoſed there muſt be ſome other paſſage from the Uterus to the Ovaria; but if we conſider the caſe of conceptions found in theſe tubes, and the exact analogy between theſe and the tube of a hen, where we have the moſt undeniable proofs of the ſeed going through the tube, and of the eggs being impregnated that way, and of the eggs coming from the Ovarium through the tube, and ſeemingly with much greater difficulty than in women; and beſides how frequently a matter like the male ſeed, (which I ſuppoſe is ſeed,) is found in the fallopian tubes of women, as I have found in executed bodies, and in a common whore that died ſuddenly, it appears almoſt certain, that the ſeed goes through the fallopian tubes to the Ovaria to impregnate eggs, which come back thro' the ſame tubes to the Uterus. I have ſeen in a woman both the Fallopian tubes unperforated, which upon the foregoing hypotheſis, muſt have cauſed barrenneſs, and ſeed lodged in theſe tubes may have the ſame effect; which I take to be often the caſe of common whores, and women that uſe coition too frequently; and perhaps the fat in the membrane that connects the Ovaria to the tubes, may in very fat women, ſo keep theſe tubes from the Ovaria as to interrupt impregnations; and beſides theſe caſes, too much or too little of the Menſes, may deſtroy or interrupt conceptions; but the latter caſe, eſpecially in young women is very rare. From ſuch cauſes as theſe, and not from imbecility, I imagine it is that barrenneſs oftener proceeds from women than men; and though women do not propagate to ſo great an age as men, it is not, I believe, for want of being impregnated, but from their Menſes ceaſing, and thoſe veſſels being cloſed which ſhould nouriſh the Fœtus after the impregnation, as if on purpoſe to prevent the propagation of a feeble and infirm ſpecies. And from this conſideration one cannot but think that the perfection of the Fœtus, notwithſtanding it is firſt formed in the male ſeed, depends more upon the female than the male, or elſe that nature would, for the ſake of the ſpecies, have been careful to hinder men as well as women from propagating in a declining age.

CHAP. III.

Of the Fœtus in Utero.

THE Fœtus in Utero is involved in two coats, viz. Chorion, which is external, and Amnion which immediately incloſes the Fœtus. They contain a quantity of liquor, which is a proper medium for ſo tender a being as the Fœtus to reſt in, and partly ſecures it from external injuries, as the aqueous humour does the cryſtaline in the eye; and when the membranes burſt at the time of production, this humour lubricates the Vagina Uteri, to render the birth leſs difficult.

cult. And ſeeing the ſtomach of a Fœtus in Utero is always full of a fluid like what is contained in the Amnion, and the guts always filled with excrements; is it not reaſonable to ſuppoſe that this fluid is frequently, during the time of geſtation, ſwallowed by the Fœtus, if not for nouriſhment, at leaſt to keep theſe parts in uſe, and to flow through the lacteals (as a quantity of blood from the right ventricle of the heart, flows thro' the lungs before the birth) to keep open thoſe paſſages 'till the birth, there being after that time no other way of receiving nouriſhment? And are not the Fæces found in the guts of a Fœtus chiefly thoſe parts of this fluid that were taken in at the mouth, and were too groſs to enter the lacteals?

Besides theſe coats, in a cow and many other animals, we find another membrane called Allantois; it is incloſed by the Chorion together with the Amnion, and contains a large quantity of water which it receives from the bladder of urine by the Urachus. Its uſe ſeems to be to contain the urine that it might not by the common paſſage be emptied into the liquor of the Amnion, of which the Fœtus, I am inclined to think, is frequently drinking. Yet I own it takes off very much from the probability of the opinion of the Fœtus's imbibing this liquor, that, if I am rightly informed, ſome who have been born with mouths and noſtrils unperforate, have had ſuch fluids and excrements in the inteſtines that other Fœtus's have, which may indeed be derived from the ſalivary glands and from the liver, &c. The following curious paſſage was ſent me by Mr. Monro. "This liquor contributes nothing to "the nouriſhment of the Fœtus for theſe reaſons; "firſt, becauſe, as you have well obſerved, vaſt "numbers of inſtances might be produced, where "no paſſage was to be found for it: I ſhall give "you one I ſaw my ſelf in the Hotel de Dieu at "Paris in 1718.

"Mary Guerlin brought forth two children, "one a compleat girl, the other had neither "head, neck, arms, heart, lungs, ſtomach, ſmall "guts, liver, ſpleen, nor Pancreas, yet the great "guts, the organs of urine and generation of a "female, and lower extremities were perfect, "and of a natural growth; the umbilical vein, "after entering the Abdomen ſplit into a great "many branches, which were diſtributed to the "ſeveral parts in its Abdomen. Though it is "true that ſoon after conception, the liquor in "the Amnion, and that in the ſtomach of the "Fœtus reſemble one another pretty near, yet "afterward they differ exceedingly, for the liquor in the ſtomach is ſtill gelatinous, thick, "and without acrimony, while the other becomes "thinner and more acrid; whereas, had the Fœtus conſtantly ſwallowed this liquor, the caſe "would have been quite oppoſite; nay, often it "has happened that theſe waters (as they are "commonly called) have been found quite corrupted, ſtrongly fetid, and extreamly ſharp, "while the Fœtus, except the injuries which the "external parts received, was well and ſound; "witneſs the example mentioned by Bellinger, "of a woman who was cured of a virulent Gonorrhea during her going with child. And "farther by Malpighius's delineations of the "Pullus in Ovo, it appears to me evident that "the Aſitellus ſerves the ſame purpoſe as the "Placenta does in viviparous animals, to convey the Albumen attenuated by incubation into "the blood-veſſels of the chick, and that none "of the Albumen does paſs through the Saccus "Colliquamenti."

WHETHER an Allantois is to be found with a human Fœtus or no, anatomiſts are not all agreed, and I cannot give my opinion having never had a ſufficient opportunity to enquire. But children having an Urachus one cannot well doubt of the Allantois. I have been informed by a gentleman, whoſe probity I can ſufficiently rely on, that he had ſeen a child that had no external genital parts, and made water through the navel. At Henley upon Thames, there is now living a bargeman's child about ten years old, of which child I had the like account; but upon examination I found an unperforated Glans with its Frœnum immediately below the place of the navel, and the urine iſſued out by drops between this and the belly, in the place which I ſuppoſe was the navel, but it was ſo much excoriated, that I could make no certain judgment about it. In the Uterus of a cow with two calves, I found they had but one Chorion, but each an Amnion, and Allantois diſtinct, but the cotyledons which are analagous to the Placenta of the humane Fœtus,

tus, were pretty much in common to the umbilical blood veſſels of both.

THE Placenta, or womb-liver, is a maſs of blood veſſels ſeated on the outſide of the Chorion, being compoſed of the extream branches of the umbilical vein and arteries, which are for the compoſition of this part divided into exceeding ſmall branches to join a like number of the menſtrual veſſels of the Uterus; which veſſels of the Uterus are made numerous rather than large, that the ſeparation of the Placenta from them may not be attended with a flux of blood fatal to the mother; for the ſides of little veſſels ſoon collapſe and cloſe, and they are more eaſily ſtopped, being compreſſed by the Uterus it ſelf as it ſhrinks, which it begins to do from the time of the birth; but when the Placenta is ſeparated before the delivery, whether untimely or not, theſe veſſels bleed until the Uterus is diſcharged of the Fœtus. The figure of the Placenta is circular, and at its greateſt growth about two inches thick, and ſix or ſeven diameter.

THE arteries and veins of the Uterus of the mother, by which the menſtrual purgations are made, are joined to the umbilical arteries and veins in the Placenta of the Fœtus, the arteries of the Uterus to the veins in the Placenta, and the veins in the Uterus to the arteries of the Placenta: By theſe veſſels a large quantity of blood is continually flowing from the mother to the Fœtus and back again; but for what end ſuch a quantity flows continually and back again, I cannot conceive, unleſs it is that the Fœtus not breathing for it ſelf, it is neceſſary that as much blood of the mother ſhould flow continually to the Fœtus, as can leave enough air, or whatever our blood receives in the lungs for the Fœtus; and perhaps what nutritious juices the Fœtus receives, require a great deal of blood to convey them, they being but a ſmall part of the blood. The navel-ſtring or umbilical blood-veſſels, between the Placenta and the navel, are about two foot long, that the Fœtus may have room to move without tearing the Placenta from the Uterus, which being done too ſoon, from whatever cauſe, occaſions a miſcarriage. Theſe veſſels, viz. two arteries and one vein twiſt about each other, particularly the arteries about the vein, and are contained in one common coat together with a veſſel called Urachus, which ariſes from the top of the bladder of urine, and ends in the membrane Allantois; the umbilical vein goes Tab.xxxi. 1. from the navel directly into the liver, and there enters the great trunk of the Vena Portæ. Near Tab.xxxi. 2. which entrance, there goes out the Ductus Venoſus to the great trunk of the Cava, which carries Tab.xxxi. 4. part of the blood that is brought by the umbilical vein, that way into the Cava, while the reſt circulates with the blood in the Porta, the whole of it not paſſing through the Ductus Venoſus as is generally believed, but a great part of it into branches of the Porta, in the liver; otherwiſe there need be no communication between the umbilical vein and the Porta; and when the umbilical vein is ſtopped, it becomes a ligament, and the Ductus Venoſus ſoon ſhrinks and almoſt diſappears, having no longer any blood flowing through it; and even the Porta it ſelf within the liver (from whence only blood could paſs after the birth into the Ductus Venoſus) has leſs blood flowing through it for ſome time than it had before the birth, it receiving much blood before the birth from the umbilical vein. The blood which flows from the mother to the Fœtus by the umbilical vein, is returned (all but a ſmall quantity, which is reſerved for nutrition) by the two umbilical arteries, which ariſe from the internal iliac arteries, and paſſing by the outſides of the bladder go directly to the navel and Placenta; theſe with the Urachus being ſhrunk up after the birth, loſe much of their appearance, eſpecially near the navel, where they are ſometimes not to be diſtinguiſhed.

PART of the blood before the birth and not the whole quantity, as is generally thought, which is brought by the aſcending Cava to the right auricle, paſſes at once through the Foramen Ovale into the left auricle, and the reſt flows into the right ventricle with the blood of the deſcending Cava, and thence into the pulmonary artery; where about one half flows into the lungs, and the other half directly into the Aorta by the Ductus Arterioſus, which lies between the pulmonary artery, and the Aorta, which after the birth is called Ductus Arterioſus in Ligamentum Verſus. The better to explain this contrivance, I will call the quantity of blood flowing through the aſcending Cava in a given time four, and that which flows through the deſcending Cava two: Then let two of the quantity in the aſcending Cava flow into the right auricle, it will then with the two received from the deſcending Cava have the quantity four; which being thrown from the right ventricle into the pulmonary artery, the quantity two is thrown into the Aorta by the Ductus Arterioſus, and the ſame quantity into the lungs by the pulmonary branches; then the quantity returning from the lungs to the left auricle, will be two in the ſame given time, which being added to the two which flowed through the Foramen Ovale, in the ſame time there will be conſtantly the ſame proportions received into each ventricle at every Diaſtole of the ventricles, as after the birth. Now if the blood flowing through the aſcending Cava joined by that from the umbilical vein, was but equal to that flowing through the deſcending, let each of them be called two, and let all the blood of the aſcending Cava go through the Foramen Ovale; then the blood which the left ventricle would receive, would exceed that which flows into the right, by the whole quantity which flows from the lungs in the ſame time; but the aſcending Cava conveying more blood than the deſcending Cava, the exceſs in the left ventricle would be yet greater. If the proportions which I have taken for the eaſier computing were perfectly right, as I am ſure they are nearly, then the quantity flowing into the left ventricle, would be to that flowing into the right at the ſame time as five to two, if all the aſcending blood went through the Foramen Ovale.

And though after the birth the left ventricle of the heart is only employed in throwing blood into the Aorta, and the right wholly employed in circulating the blood through the lungs; yet before the birth all the blood thrown out by the left ventricle, and about half the blood thrown out of the right ventricle, being thrown into the Aorta, and the other part only through the lungs, it follows that the whole force exerted by the left ventricle, with about half that of the right, is employed in throwing blood into the Aorta, while that diſtributes blood through the whole Fœtus, and to the mother: But after the birth, when the blood is to be no longer carried from the Fœtus to the mother, the left ventricle becomes ſufficient for the circulation through the Fœtus, and a new occaſion immediately ariſes for that additional power, which before was neceſſarily employed in throwing blood into the Aorta; for the whole maſs of blood now being to be circulated through the lungs, the Ductus Arterioſus cloſes, and the right ventricle muſt throw all the blood it receives into the lungs, there being no longer any paſſage into the Aorta. It is ſuppoſed that the inflation of the lungs at the birth, preſently alters the poſition of the Ductus Arterioſus, ſo as to obſtruct it; which account is indeed mechanical, but I think not true, becauſe I can neither diſcern that the poſition of this veſſel is altered, nor its ſurface compreſſed: But I rather think that immediately upon the birth, there being no blood carried off from the Fœtus to the mother, and the left ventricle being ſufficient to fill the Aorta and its branches with blood, as I have ſhewn before, there is no longer room for any blood from the right ventricle; wherefore the blood from the right ventricle will be forced into the lungs, where the paſſage is now made eaſy, as I imagine, by their being inflated; and the Ductus Arterioſus, having the blood no longer forced into it, ſhrinks, and in time almoſt diſappears. This duct being ſtopped, the valve of the Foramen Ovale immediately ſtops that paſſage, it being on the ſide of the left auricle (or that muſcular bag, which is the largeſt part of that auricle) which is much the ſtrongeſt, muſt at all times be preſſed more on that ſide than the other by the blood in the time of the Syſtole of the auricle; and it is as evident that in the Diaſtole of the auricle, there muſt be more preſſure to open that than the right, it being a ſtronger muſcle, or elſe there could have been no reaſon for having the left auricle ſtronger than the right in proportion to their ventricles. Sometimes this valve does not quite cover the Foramen, in which caſe a ſmall quantity of blood may poſſibly flow from the left auricle to the right, and ſo circulate twice through the lungs to once through the body, but none could flow from the right to the left and eſcape the lungs, which might be of bad conſequence. Some have imagined, that men who have this paſſage open, cannot be drowned: But though this paſſage is ſometimes found open, no Man has been yet ſeen, that we have ever heard of, that could not be drowned. I have ſeen the Foramen open in a man that was hanged, to

whom

whom one might juſtly expect it ſhould have been as uſeful as in the caſe of ſubmerſion in water. Many writers have ſuppoſed that this Foramen is open in amphibious animals, and in ſuch fiſhes as have two auricles, two ventricles and lungs like land animals, without gills (which in other fiſh are analogous to lungs.) I have diſſected a porpus which is of this kind, and found this Foramen cloſed; but the great veins were vaſtly large in proportion to the bulk of the animal; whence I conjectured their blood was accumulated in their veins, while they kept under water, and by that means the lungs eſcaped being oppreſſed with blood; which conjecture ſeemed to me the more probable, ſince all animals of this kind are able to abide the leaſt time under water, when their blood is moſt expanded with heat. But upon the diſſection of an otter, whoſe Foramen Ovale was alſo cloſed, I found the veins nothing differing from thoſe of other animals. In a water tortoiſe which I had an opportunity of examining, with that moſt dextrous and indefatigable anatomiſt Dr. Douglaſs, I found the two ventricles of the heart but half divided by a Septum, and in the beginning of the pulmonary artery ſeveral ſtrong muſcular rings, a little diſtance from each other, each of which by contracting, would be capable of reſiſting a part of that blood, which otherwiſe would have been thrown into the lungs, when they were under water; and this blood ſo obſtructed muſt neceſſarily be thrown into the Aorta, the two ventricles being in a manner one common cavity; and when they are out of the water, this communication of ventricles, will ſuffer but little confuſion of the blood which flows into the ventricles, becauſe each ventricle receiving and diſcharging the ſame quantity of blood, at the ſame time, they will balance each other, and thereby ſuch a mixture will be very much prevented. Mr. Monro obſerves, that the water tortoiſe has very large lungs, conſiſting of larger veſicles than land animals, and that they receive a greater quantity of air to furniſh that Je ne ſçai quoi ſo neceſſary for the life of animals: The ſame thing I remember to have obſerved in frogs.

As to the reaſon of womens bringing-forth at the uſual time; it has been ſaid, that at that time, the head of the child begins to be ſpecifically heavier than the reſt of the body, and therefore muſt fall loweſt in the fluid it lies in; which being an uneaſy poſture, makes the child ſtruggle, and bring on the labour. But it is not true, that the head then alters its ſpecific gravity; or if it did, there is ſeldom fluid enough in the Amnion for this purpoſe; and beſides, this could only happen right in one poſture, and would always happen wrong in brutes.

CHAP. IV.

Of the eye.

THE figure, ſituation, and uſe of the eyes, together with the eye-brows, eye-laſhes, and eye-lids, being well known, I think, I need only deſcribe what is uſually ſhewn by diſſecting. The orbit of the eye, or cavity in which it is contained, is in all the vacant places filled with a looſe fat, which is a proper medium for the eye to reſt in, and ſerves as a ſocket for it to be moved in. In the upper and outer part of the orbit, is ſeated the lacrymal gland. Its uſe is to furniſh at all times water enough to waſh off duſt and to keep the outer ſurface of the eye moiſt, without which the Tunica Cornea would be leſs pellucid, and the rays of light would be diſturbed in their paſſage; and that this liquor may be rightly diſpoſed of, we frequently cloſe the eye-lids to ſpread it equally, even when we are not conſcious of doing it. At the inner corner of the eye, between the eye-lids, ſtands a caruncle, which ſeems to be placed to keep that corner of the eye-lids from being totally cloſed, that any tears or gummy matter may flow from under the eye-lids, when we ſleep, or into the Puncta Lacrymalia, which are little holes, one in each eye-lid, near this corner, to carry off into the Ductus ad Naſum, any ſuperfluous tears.

THE firſt membrane of the eye is called Conjunctiva, it covers ſo much of the eye as is called the white, and being reflected all round it lines the two eye-lids; it being thus returned from the eye to the inſide of the eye-lids; it effectually hinders any extraneous bodies from getting behind the eye, into the orbit, and ſmooths the parts it covers, which makes the friction leſs between the eye and the eye-lids. This coat is very full of blood veſſels, as appears upon any inflammation.

TUNICA SCLEROTIS, and CORNEA, make together one firm caſe of a proper form, for the uſe of the other coats and humours. The forepart of this ſtrong coat being tranſparent, and like horn, is called Cornea, and the reſt Sclerotis. Under the Cornea lies the Iris which is an opake membrane, like the Tunica Choroides, but of different colours in different eyes, ſuch as the eye appears, as grey, black, or hazel, for it being ſeated under the Tunica Cornea, it gives ſuch an appearance to that as it has its ſelf. The middle of it is perforated for the admiſſion of the rays of light, and is called the pupil. Immediately under the Iris lie the Proceſſus Ciliares, like radial lines from a leſſer circle to a greater. When theſe proceſſes contract, they dilate the pupil to ſuffer more rays of light to enter into the eye; and the contrary is done by the circular fibres of the Iris, which act as a ſphincter muſcle: But theſe changes are not made with great quickneſs, as appears from the eyes being oppreſſed with a ſtrong light, for ſome time after we come out of a dark place, and from the contrary effect in going ſuddenly from a light place to a dark one. And as the pupil always dilates in darker places, to receive more rays of light; ſo when any diſeaſe makes ſome of thoſe rays ineffectual, which paſs through the pupil, it dilates as in dark places to admit more light; therefore a dilated pupil is a certain ſign of a bad eye, and this may be diſcerned uſually ſooner than the patient diſcerns any defect in viſion. In men the pupil is round, which fits them to ſee every way alike; it is alſo round in animals that are the prey both of birds and beaſts. But graminivorous brutes that are too large to be the prey of birds, have it oblong horizontally, which fits them to view a large ſpace upon the earth; while animals of the cat-kind, who climb trees, and prey indifferently on birds or animals that hide in the earth, have their pupils oblong the contrary way, which fits them beſt to look upward and downward at once. Beſides theſe there are other animals whoſe pupils are in theſe forms, but in leſs proportions, ſo as beſt to fit their ways of life. Immediately under the Sclerotis, is a membrane of little firmneſs, called Choroides; in men it is of a ruſty dark colour, ſuch as will bury almoſt all the rays of light, that paſs through the Tunica Retina, which if it were of a brighter colour, would reflect many of the rays upon the Retina, and make a ſecond image upon the firſt ſomewhat leſs, and leſs diſtinct, but both together ſtronger; which is the caſe of brutes of prey, where a great part of this coat is perfectly white, which makes them ſee bodies of all colours in the night better than men, for white reflects all colours: But brutes that feed only on graſs, have the ſame parts of this membrane of a bright green, which enables them alſo to ſee with leſs light, and makes graſs an object that they can diſcern with greateſt ſtrength: But theſe advantages in brutes, neceſſarily deſtroy great accuracy in viſion, which is of little or no uſe to them, but to men of great conſequence. This green part of the Tunica Choroides, in animals that graze, may properly be called Membrana Uvea, from its reſemblance in colour, to an unripe grape. But in men's eyes, only a white circle round the back ſide of the Choroides near the Cornea, is called Uvea.

IMMEDIATELY under the Tunica Choroides, lies the Tunica Retina, which is the optic nerve expanded and co-extended with the Choroides. Rays of light ſtriking upon this membrane, the ſenſation is conveyed by the optic nerves, to the common Senſorium the brain; theſe nerves do not enter at the middle of the bottom of the eyes, but nearer the noſe; for thoſe rays of light being ineffectual for viſion that fall upon the entrance of the optic nerves, it is fit they ſhould ſo enter, as that the ſame object, or part of any object, ſhould not be unperceived in both eyes, as would have been the caſe, had they been otherwiſe inſerted; which appears from a common experiment of part of an object being loſt to one eye, when we are looking towards it with the other ſhut. I know a gentleman who having loſt one eye by the ſmall-pox, and going through a hedge a thorn unſeen (probably from this cauſe) ſtruck the other and put it out. The two optick nerves ſoon after they ariſe out of the brain join and ſeem perfectly united, yet from the following caſe, I am not without ſuſpicion of their fibres being preſerved diſtinct, and that the nerve of each eye, ariſes wholly from the oppoſite ſide of the brain, or elſe that the other nerves throughout the body ariſe from the brain, and Medulla Oblongata on the ſides oppoſite to thoſe they come out of. A ſoldier who was my patient in the hoſpital about five years ſince, had, by a puſh with a broad ſword, his left eye raſed out of the orbit, which I replaced with my fingers; it was preſently followed with exceſſive pain in the right ſide of the head only, and a loſs of the ſenſe of feeling and motion in both the right limbs; the ſenſe of feeling he recovered by degrees in about a month, and ſoon after, began to recover their motion, but was about twelve months before he could walk, and lift up his hand to his head; and in about two years recovered all but the ſight of the wounded eye, which indeed did not appear perfect. In fiſh theſe nerves ariſe diſtinct from the oppoſite ſides of the brain, and croſs without uniting; but as theſe animals have their eyes ſo placed, as not to ſee the ſame object with both eyes at once, whereas animals whoſe optic nerves ſeem to unite, do ſee the ſame object with both eyes at once, one would ſuſpect that in one they were joined to make the object not appear double, and in the other diſtinct, to make their two eyes (as they are to view different objects at the ſame time) independent on each other; and yet from the following caſes, the ſeeing objects ſingle ſeems not to depend upon any ſuch union, nor from the light ſtriking upon correſponding fibres of the nerves, as others have believed, but upon a judgment from experience, all objects appearing ſingle to both eyes in the manner we are moſt uſed to obſerve them, but in other caſes double; for though we have a diſtinct image from each eye ſent to the brain, yet while both theſe images are of an object ſeen in one and the ſame place, we conceive of them as one, ſo when one image appears to the eyes (when they are diſtorted or wrong directed) in two different places, it gives the idea of two; and when two bodies are ſeen in one place, as two candles rightly placed, through one hole in a board, they appear one. But caſes of this kind being too numerous, I will conclude with one very remarkable, and I think much in favour of this opinion. A gentleman who, from a blow on the head, had one eye diſtorted, found every object appear double, but by degrees the moſt familiar ones became ſingle, and in time all objects became ſo, without any amendment of the diſtortion.

The inſide of the eye is filled with three humours, called aqueous, cryſtalline and vitreous. The aqueous lies foremoſt, and ſeems chiefly of uſe to prevent the cryſtalline from being eaſily bruiſed by rubbing or a blow, and perhaps it ſerves for the cryſtalline humour to move forward in while we view near objects, and backward for remoter objects; without which mechaniſm, or in the place of it a greater convexity in the cryſtalline humour in the former caſe, and a leſs convexity in the latter, I do not imagine, according to the laws of optics, how we could ſo diſtinctly ſee objects at different diſtances. However it is in land animals, I think we may plainly ſee, that fiſh move their cryſtalline humour, nearer the bottom of the eye when they are out of water, and the contrary way in water; becauſe light is leſs refracted from water through the cryſtalline humour than from air. Some have ſaid, that amphibious animals have a membrane like the Membrana Nictitans of birds, which ſerves them as a Lens in the water. I have examined the eye of a crocodile, which Sir Hans Sloan keeps in ſpirits, and I found this membrane equally thick and denſe, and conſequently unfit for this purpoſe, or I believe any other except that obvious one, of defending the eye from the water. Next behind the aqueous humour lies the cryſtalline; its ſhape is a depreſſed ſpheroid, it is diſtinctly contained in a very fine membrane called Aranea. The uſe of this humour is to refract the rays of light which paſs through it, ſo that each pencil of rays from the ſame point of any object, may be united upon the Retina (as in a Camera Obſcura) to make the ſtronger impreſſion; and though by this union of the rays a picture inverted is made upon the Retina, yet ſurely it is the impulſe only of the rays upon the Retina, that is the cauſe of viſion; for had the colour of the Retina been black, and conſequently unfit to receive ſuch a picture, would not the impulſe of light upon it have been ſufficient for viſion? Or would ſuch a picture, if it could have been made without any impulſe, have ever conveyed any ſenſation to the brain? Then if the impulſe of light upon the Retina, and not the image upon the Retina, is the cauſe of viſion; when we enquire why an image inverted in the eye appears otherwiſe to the mind, might we not expect to find the true cauſe from conſidering the directions in which the rays ſtrike the Retina, as we judge of above and below from a like experience, when any thing ſtrikes upon any part of our bodies; nevertheleſs in viewing an object through a Lens, we conceive of it as inverted, when as in receiving the impulſes of light in the ſame manner, and having the picture on the Retina in the ſame attitude, when we ſtand on our heads without the Lens, we have not the ſame, but the contrary idea of the poſition of the object. Though I have conſidered this humour only as a refractor of light, yet the firſt and greateſt refraction is undoubtedly made in the Cornea; but it being Concavo-convex, like glaſſes of that kind, while one ſide makes the rays of light converge, the other diverges them again. The ſame thing alſo may be obſerved of the aqueous humour, which is indeed more concave than convex; but when the cryſtalline humour is removed in the couching a cataract the aqueous poſſeſſes its place and becomes a Lens; but that refracting light leſs than the cryſtalline,

ſtalline, whoſe place and ſhape it partly takes; the patient needs a convex glaſs to ſee accurately. In ſome eyes either this humour being too convex or too diſtant from the Retina, the rays unite too ſoon unleſs the object is held very near to the eye, which fault is remediable by a concave glaſs, as the contrary fault (common to old perſons) is by a convex glaſs. Here it may not be improper to obſerve, how wiſely providence has fixed the diſtance, at which we ordinarily ſee objects beſt; for if the eye had been formed for a nearer view, the object would often obſtruct the light; if it had been much farther, light enough would not commonly have been produced from the object to the eye. In fiſh the cryſtalline humour ſeems a perfect ſphere, which is neceſſary for them, becauſe light being leſs refracted from water through the cryſtalline humour than from air, that defect is compenſated by a more convex Lens. The vitreous humour lies behind the cryſtalline, and fills up the greateſt part of the eye: Its foreſide is concave for the cryſtalline humour to lodge in, and its backſide being convex the Tunica Retina is ſpread over it; it ſerves as a medium to keep the cryſtalline humour and the Retina at a due diſtance.

The larger animals having larger eyes, their organs of viſion (like a microſcope with a large Lens) are fit to take in a greater view, but in that view things are not ſo much magnified; ſo in the leſſer animals a ſmall ſpace is diſcerned, ſuch as is their ſphere of action, but that greatly magnified, not really ſo in either caſe, but comparatively; for viſion ſhews not the real magnitude of objects, but their proportions one to another. Fiſh have their eyes, and particularly their pupils, larger than land animals, becauſe there is leſs light, and that not ſo far diſtributed in water as in the air.

CHAP. V.

Of the ear.

THE figure and ſituation of the outer ear, needs no deſcription. Its inner ſubſtance is cartilage, which preſerves its form without being liable to break: Its uſe is to collect ſounds, and direct them into the Meatus Auditorius, which is the paſſage that leads to the drum; this paſſage is lined with a glandular membrane, in which alſo is ſome hair; the Cerumen which is ſeparated by theſe glands, being ſpread all over this membrane, and its hairs, ſerve to defend the membrane from the outer air, and to entangle any inſect that might otherwiſe get into the ear. Sometimes this wax being ſeparated in too great quantity, it fills up the paſſage and cauſes deafneſs; and thoſe great diſcharges of matter from the Meatus Auditorius, which are commonly called impoſtumes in the ear, I think can be nothing elſe than ulcerations, or great ſecretions from theſe glands. At the farther end of the Meatus Auditorius lies the drum, which is extended upon a bony ridge almoſt circular: Its ſituation in men and brutes is nearly horizontal, inclined towards the Meatus Auditorius, which is the beſt poſition to receive ſounds; the greateſt part of which being ordinarily reverberated from the earth. In its common ſituation in men and brutes, it is concave outward, but in birds it is convex outward, ſo as to make the upper ſide of it nearly perpendicular to the horizon; which ſerves them better to hear each others ſounds when they are high in the air, where they can receive but little reverberated ſound. This membrane does not entirely cloſe the paſſage, but has on one ſide a ſmall aperture covered with a valve. I found it once half open in a man that I diſſected, who had not been deaf, and I have ſeen a man ſmoak a whole pipe of tobacco out through his ears, which muſt go from the mouth, through the Euſtachian tube, and through the Tympanum, yet this man heard perfectly well. Theſe caſes occaſioned me to break the Tympanum in both ears of a dog, and it did not deſtroy his hearing, but for ſome time he received ſtrong ſounds with great horror. And that moſt excellent anatomiſt Mr. St. Andre, to whom I am greatly obliged in this chapter, has aſſured me, that a patient of his had the Tympanum deſtroyed by an ulcer, and the auditory bones caſt out, without deſtroying his hearing. In very young children I have always found this membrane covered with Mucus, which ſeems neceſſary to prevent ſounds from affecting them too much, there being no proviſion to ſhut the ears, as there is for the eyes. A gentleman well known in this city, having had four children born deaf, was adviſed to lay bliſters upon the heads of the next children he might have, which he did to three which were born afterward, and every one of them heard well. It ſeems not unreaſonable to ſuppoſe that too great a quantity of this Mucus upon the drum, might be the cauſe of deafneſs in the four children, and that the diſcharge made by the bliſters in the latter caſes, was the cauſe of their eſcaping the ſame misfortune.

INTO the middle of the Tympanum is extended a ſmall bone called Malleus, whoſe other end is articulated to a bone called Incus, which is alſo articulated by the intervention of an exceeding ſmall one called Orbiculare, to a fourth bone called Stapes. Theſe bones are contained in that cavity behind the Tympanum, which is called the barrel of the ear; but ſome anatomiſts call the barrel only Tympanum, and the membrane Membrana Tympani. The Malleus being moved inward by the Muſculus Obliquus Internus, or Trochlearis, it extends the Tympanum that it may be the more affected by the impulſe of ſounds when they are too weak. This muſcle ariſes from the cartilaginous part of the Euſtachian tube, and paſſing from thence in a proper groove, it is reflected under a ſmall proceſs, and thence paſſes on perpendicular to the Tympanum, to be inſerted into the handle of the Malleus, ſometimes with a double tendon. Parallel to this muſcle lies another Extenſor of the Tympanum, called Obliquus Externus; it ariſes from the outer and upper part of the Euſtachian tube, and paſſing through the ſame hole with the Corda Tympani, which is a branch of the fifth pair of nerves, it is inſerted into a long proceſs of the Malleus: This is not ſo obvious an Extenſor as to be known to be ſo, without an experiment. The muſcle which relaxes this membrane is called Externus Tympani; it ariſes from the upper part of the auditory paſſage under the membrane which lines that paſſage, and is inſerted into the upper proceſs of the Malleus. The relaxation of the Tympanum is made by this muſcle, without our knowledge, when ſounds are too ſtrong; and as the pupil of the eye is contracted, when we have too much light, and dilated where there is too little, from what cauſe ſoever, ſo when ſounds are too low, or the ſenſe of hearing imperfect, from whatever cauſe, the extenſors of the Tympanum ſtretch it, to make the impulſe of ſounds more effectual upon it, juſt as in the caſe of the common drum, and the cords of any muſical inſtrument. From the cavity behind the Tympanum, which is called the barrel of the ear, goes the Euſtachian tube, or Iter ad Palatum; it ends cartilaginous behind the palate. This paſſage ſeems to be exactly of the ſame uſe with the hole in the ſide of the common drum, that is to let the air paſs in and out from the barrel of the ear, to make the membrane vibrate the better, and perhaps in the ear (which is cloſer than a common drum) to let air in or out as it alters in denſity, and if any fluid ſhould be ſeparated in the barrel of the ear to give it a paſſage out. This paſſage being obſtructed, as it is ſometimes, by a large Polypus behind the Uvula, it cauſes great difficulty of hearing, and ſometimes, when the Meatus Auditorius is obſtructed, a man opening his mouth wide, will hear pretty well through this paſſage, which is often ſo open as that ſyringing water through the noſe, it ſhall paſs through into the barrel of the ear and cauſe deafneſs for ſome time. If any one would try how he can hear this way, let him ſtop his ears, and take between his teeth the end of a wire, or cord that will vibrate well, and holding the other end, ſtrike it, and the ſound that he hears will be through this paſſage. To the Stapes there is one muſcle called Muſculus Stapedis; it lies in a long channel, and ending in the Stapes, it ſerves to pull the Stapes off of the Feneſtra Ovalis, which otherwiſe it covers. Beſides the Feneſtra Ovalis, there is another near it ſomewhat leſs, called Rotunda; theſe two holes lead to a cavity called Veſtibulum, which leads into other cavities aptly called Cochlea, and three ſemicircular canals or altogether the labyrinth, in which are ſpread the auditory nerves to receive and convey the impulſe of ſounds, to the common Senſorium the brain; and ſurely the Chorda Tympani, which is a branch of the fifth pair of nerves may alſo convey theſe ſenſations to the brain. The two holes called Feneſtra Ovalis & Rotunda, are cloſed with a fine membrane like the membrane called the drum, and the larger being occaſionally covered and uncovered by the Stapes, ſounds are thereby made to influence more or leſs, as beſt ſerves for hearing, and this advantage, being added to that of a lax or tenſe Tympanum, the effect of ſounds may be greatly encreaſed or leſſened upon the auditory nerves, expanded in the labyrinth. In the ſtrongeſt ſounds, the Tympanum may be lax, and the Feneſtra Ovalis covered, and for the loweſt the Tympanum tenſe and the Feneſtra uncovered. If ſounds propagated in the air were heard leſs, we might often be in danger before we were apprized of it, and if the organs of hearing were much more perfect, unleſs our underſtandings were ſo too, we ſhould commonly hear more things at once than we could attend to.

CHAP. VI.

Of the ſenſes of ſmelling, taſting and feeling.

THE ſenſe of ſmelling is made by the Effluvia, which are conveyed by the air to the nerves, ending in the membranes which line the noſe and its Lamellæ. In men theſe Lamellæ are few, and the paſſage through the noſe not difficult; hence fewer Effluvia will ſtrike the nerves, than in animals of more exquiſite ſmell, whoſe noſes being full of Lamellæ, and the paſſage for the air narrow and crooked, few of the Effluvia eſcape one place or another, beſides their olfactory nerves may be more ſenſible. Fiſh, though they have no noſes, yet in their mouths they may taſte Effluvia in the water, as ſurely thoſe fiſh do, who ſeek their prey in the darkeſt nights, and in great depths of water, there being more nerves diſpoſed in their mouths, than through their whole bodies beſide, the optic excepted; and it looks as if it was done for this purpoſe; for the mere ſenſe of taſting, is ordinarily leſs curious in them, than in land animals; in baiting eel baſkets, if the bait has lain long in water, it is ſeldom taken, but upon ſcarifying it afreſh, which will make it emit new effluvia, it ſerves as a freſh bait.

THE ſenſe of taſting is made in the like manner upon the nerves, which line the mouth, and ſo is that of feeling upon the nerves, diſtributed throughout the body; of which, I ſhould ſpeak largely in this place, if I had not done it already in the chapter of the nerves.

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TABLE XX[illegible]IV.II.

The urinary and genital parts of a man.

1. Arteria Aorta Deſcendens.
2. Vena Cava Aſcendens.

3, 3. The emulgent veins.

4, 4. The emulgent arteries.

5. The left kidney.
6. The emulgent vein taken out of the right kidney.

7, 7. Glandulæ Renales.

8, 8. The Ureters.

9. Part of the bladder of urine.
10. The Pelvis of the right Ureter taken out of the kidney.
11. The Tubuli Urinarii taken out of the right kidney.
12. The ſpermatic arteries.
13. The ſpermatic veins, the right entering the Cava, and the left the emulgent.

14, 14. Collateral branches of the ſpermatic vein, which on this ſide are not laid bare, and ſeparated from the artery which runs in the ſame membrane with it.

15. The left teſticle included in the Proceſſus Vaginalis or Elythroides.
16. The right teſticle denuded.
17. The right Epididymis.

18, 18. The Vaſa Deferentia.

19, 19. The Veſiculæ Seminales.

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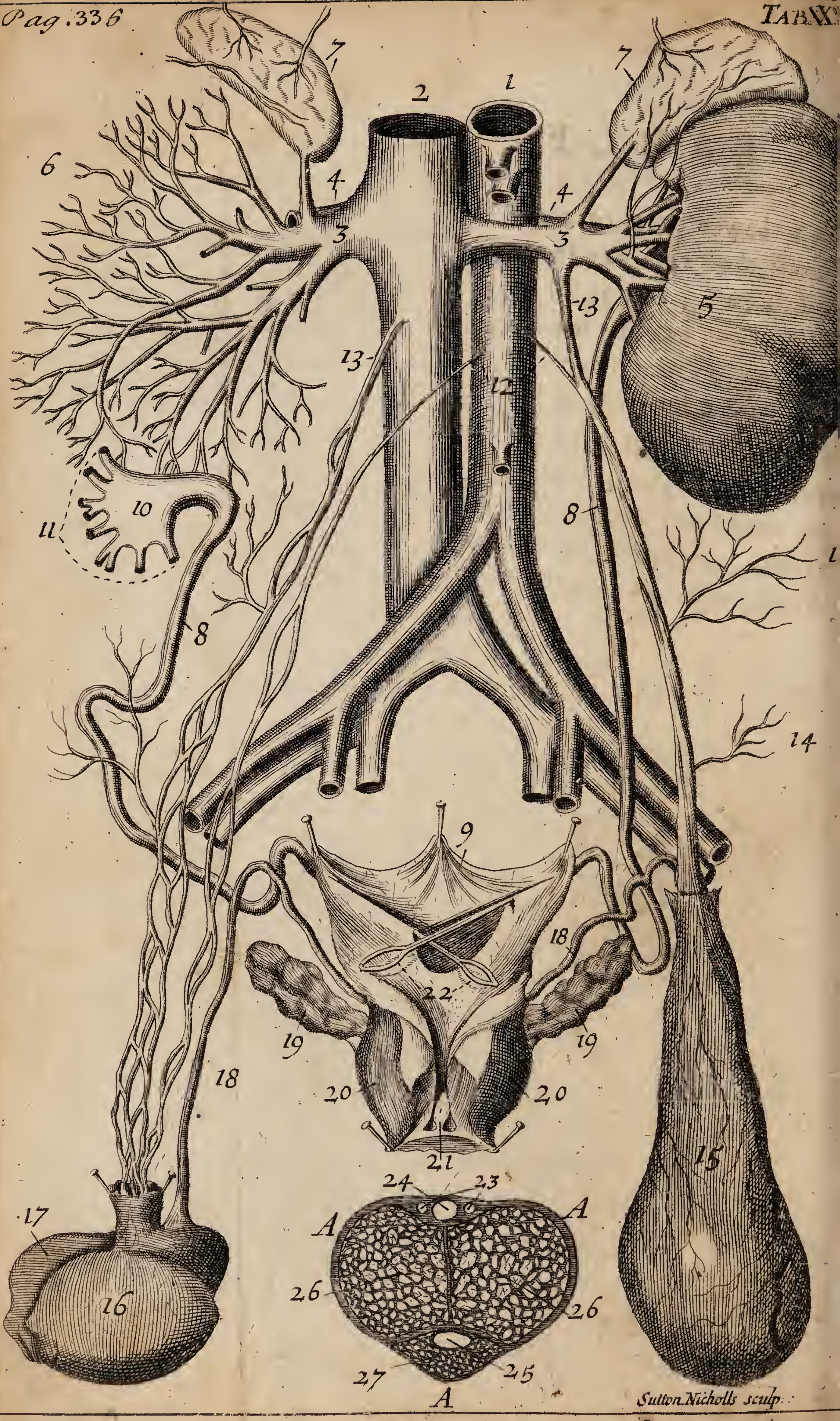


Sutton Nicholls sculp.

20, 20, The Proſtatæ.

21. The Roſtrum Gallinaginis in the Urethra.

22. Two probes put into the ureters, to ſhew their oblique paſſage into the bladder of urine.

A, A, A tranſverſe ſection of the Penis prepared with Mercury.

23. The two arteries of the Penis.

24. The Vena Ipſius Penis.

25. The Urethra.

26, 26. The Corpora Cavernoſa Penis.

27. The Corpora Cavernoſa Urethræ.

TABLE

TABLE XXVIII.

A. The teſticle of a rat.

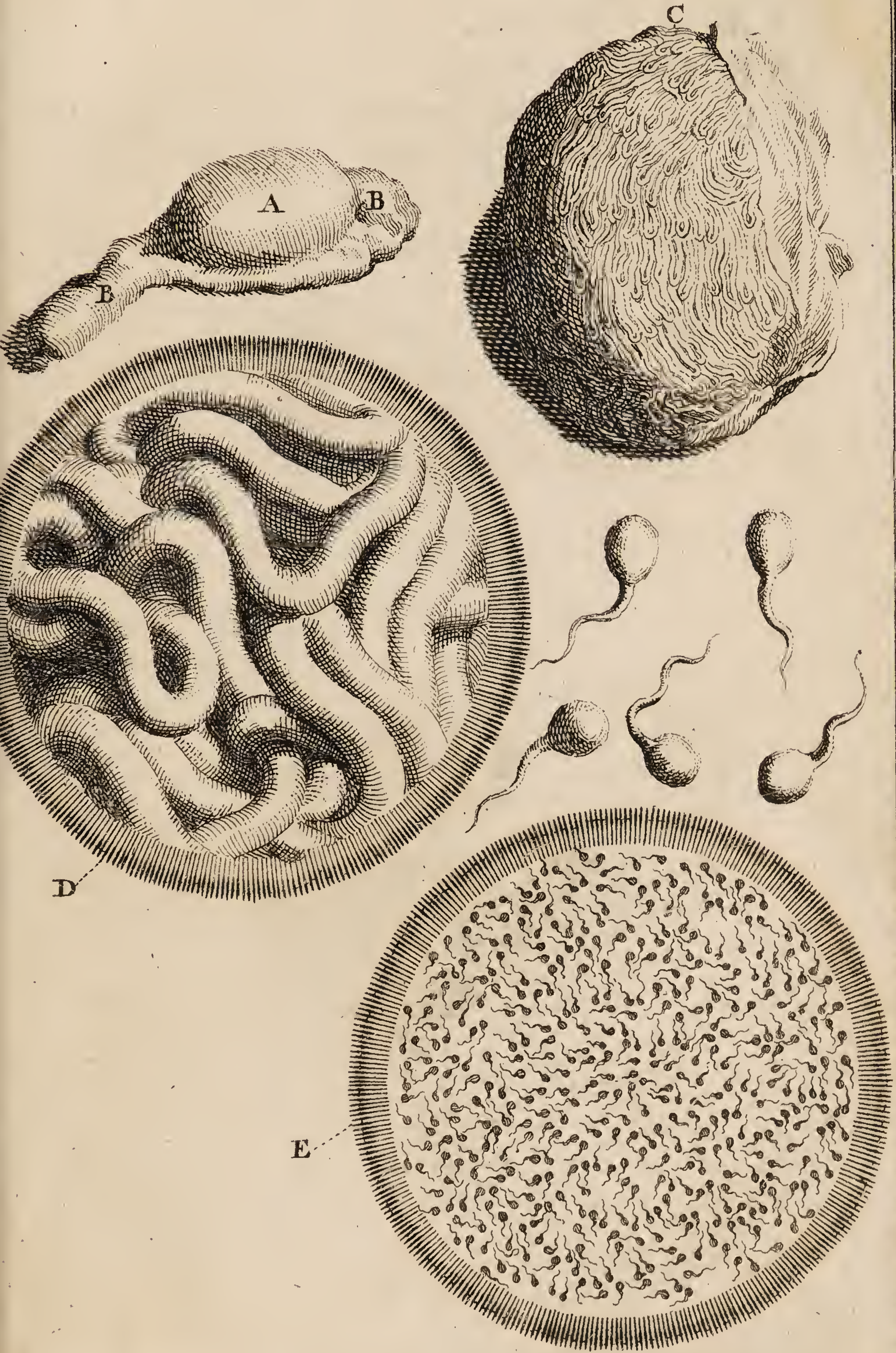
B, B. The Epididymis.

C. The ſame teſticle diveſted of the Tunica Albuginea, and magnified to ſhew the Convolutions of the veſſels.

D. An inward portion of the ſame teſticle more magnified.

E. A Group of Animalculæ, as they appear in the male ſeed in a microſcope, and five other beſides more magnified, but not repreſented enough like Tadpoles.

TAB. XXVIII



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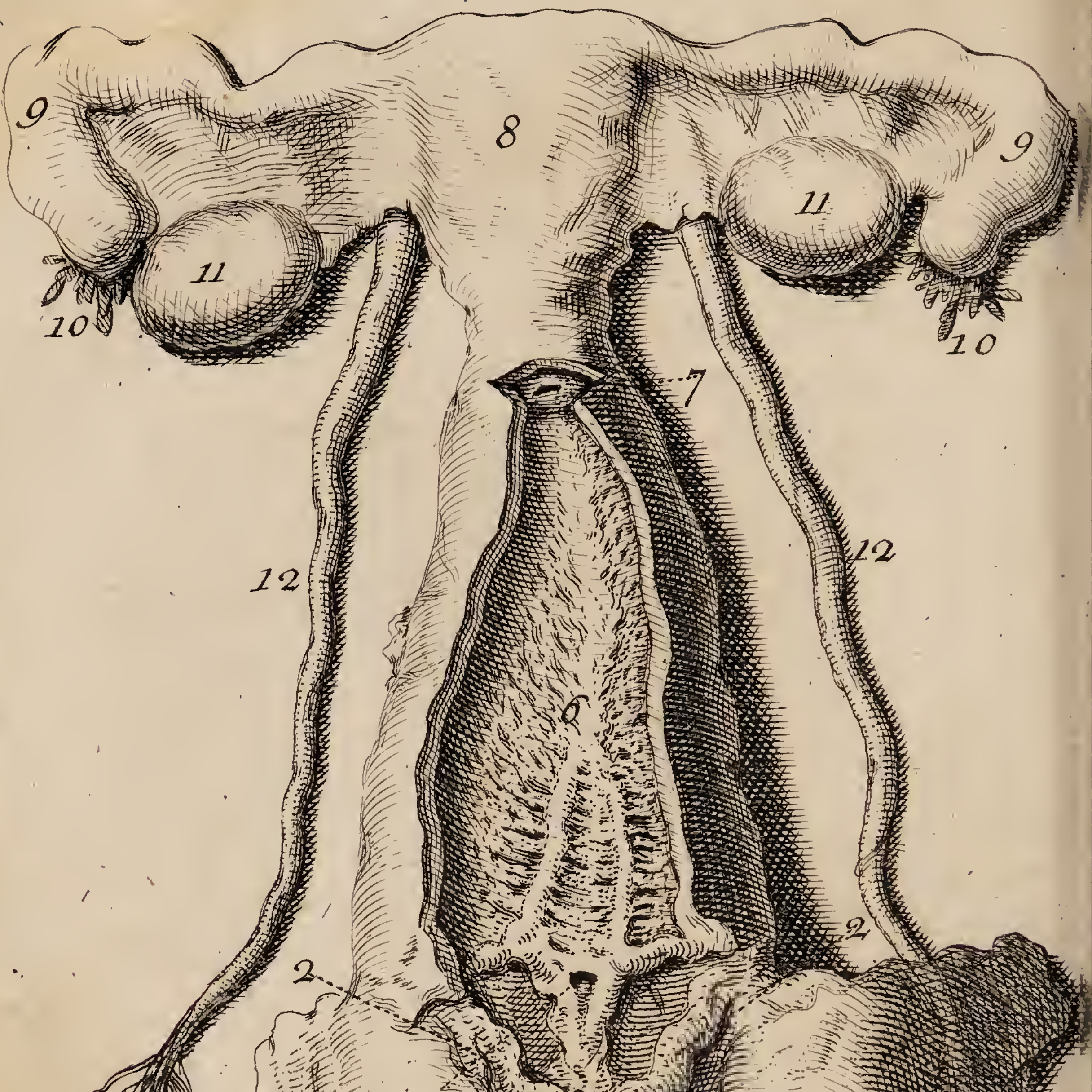
TAB. XXI



I. vdr Gucht Sculp.

TABLE XXIX.

THE parts of generation in women, the lower ſide of the Vagina being laid upward, and cut open.

1, 1. The Labia.
2, 2. The Nymphæ.
3. The Glans of the Clitoris extremely large.
4. The Præputium of the Clitoris.
5. The orifice of the Meatus Urinarius.
6. The inſide of the Vagina where the Rugæ are to be ſeen.
7. Os Tincæ.
8. Uterus.
9, 9. Tubæ Fallopianæ.
10, 10. Fimbriæ.
11, 11. Ovaria.
12, 12. Ligamenta Rotunda.

TABLE XXX.

Represents the parts of an hermaphrodite, in which appeared as much of the mixture of the ſexes as could be; (but Dr. Douglas, to whom I am obliged for this cut, and the references, eſteems it a female.) I once examined another, in which I found a divided Scrotum juſt like the Labia Pudendi, with teſticles in it, and a urinary paſſage between them, with a perfect Clitoris as large as a Penis, with an exceeding ſmall Urethra, through which came a little urine.

Figure I.

1. The Clitoris covered with its Præputium.
2, 2. The two Labia Pudendi.

Figure II.

3. The Clitoris covered with its Præputium.
4. The Glans of the Clitoris.
5, 5. The Nymphæ.
6, 6. The Labia turned back, to ſhew the entrance into the Vagina marked 7.
8. The Furca Virginalis, or the ſkin that joins the two Labia at their lower part.

TAB XXX.

Fig. I.

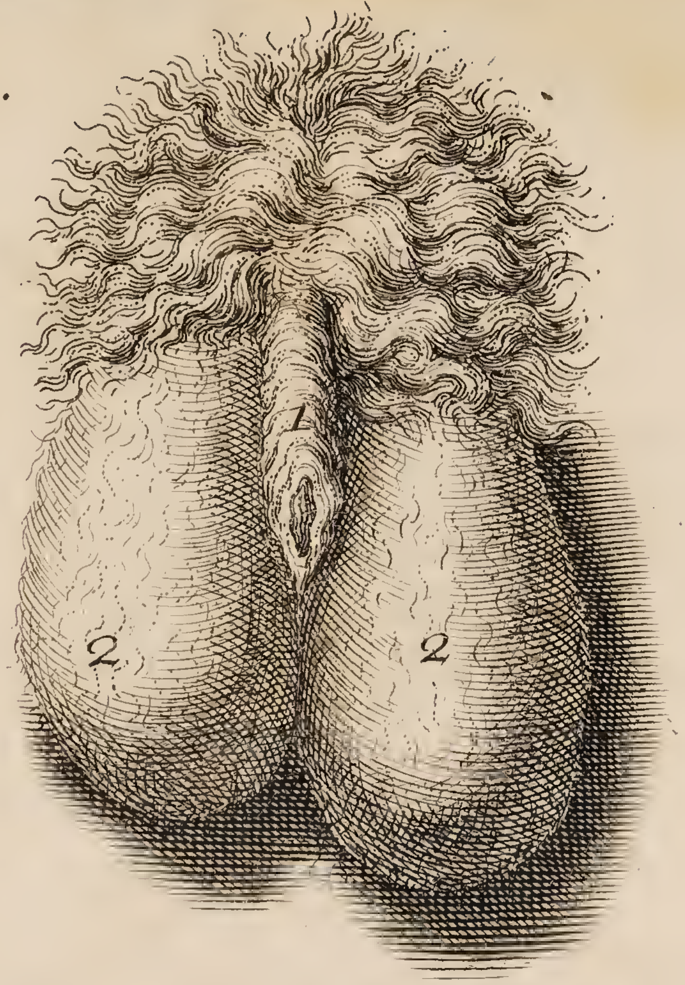
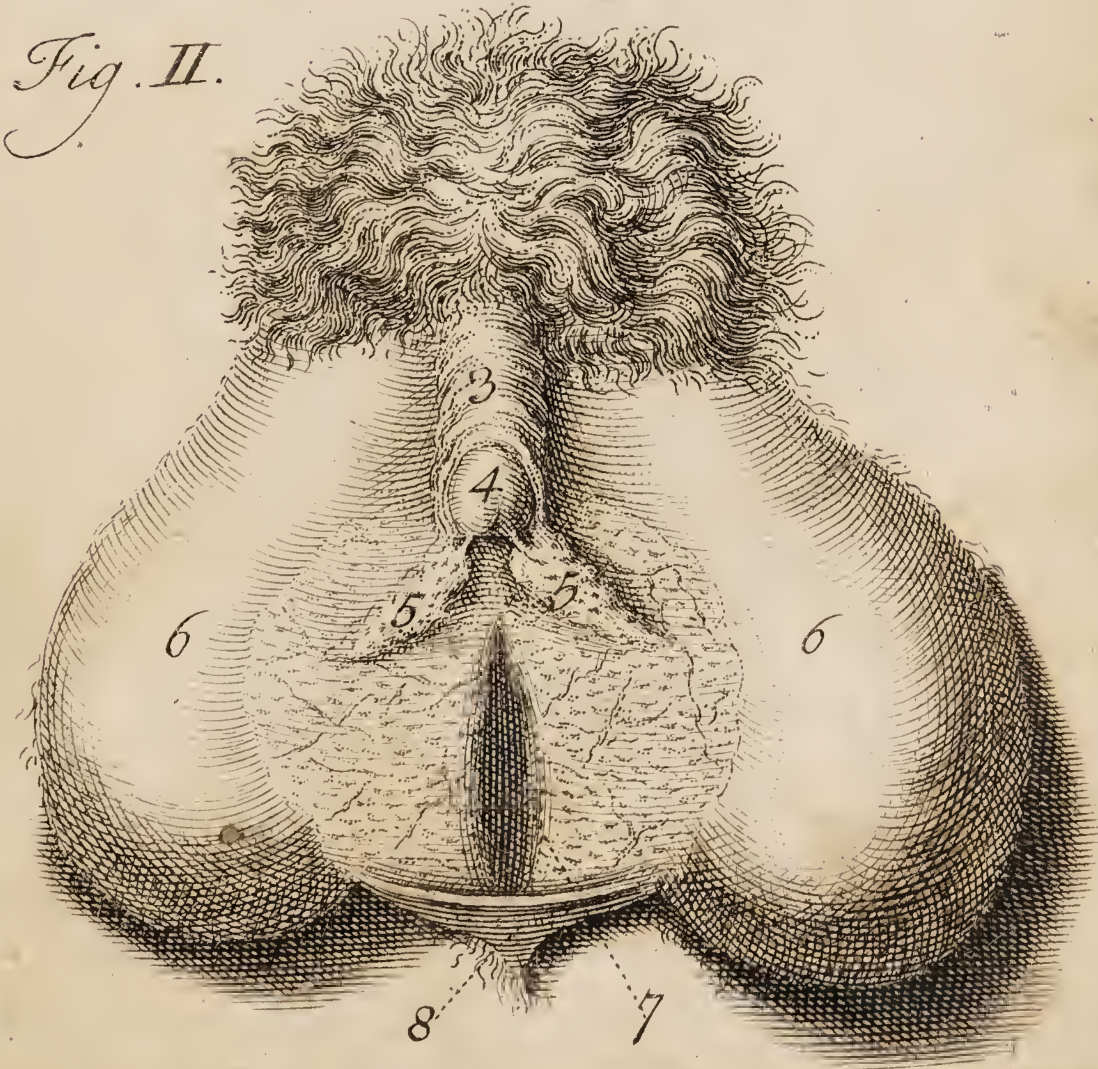


Fig. II.



V.dr Gucht Sculp:

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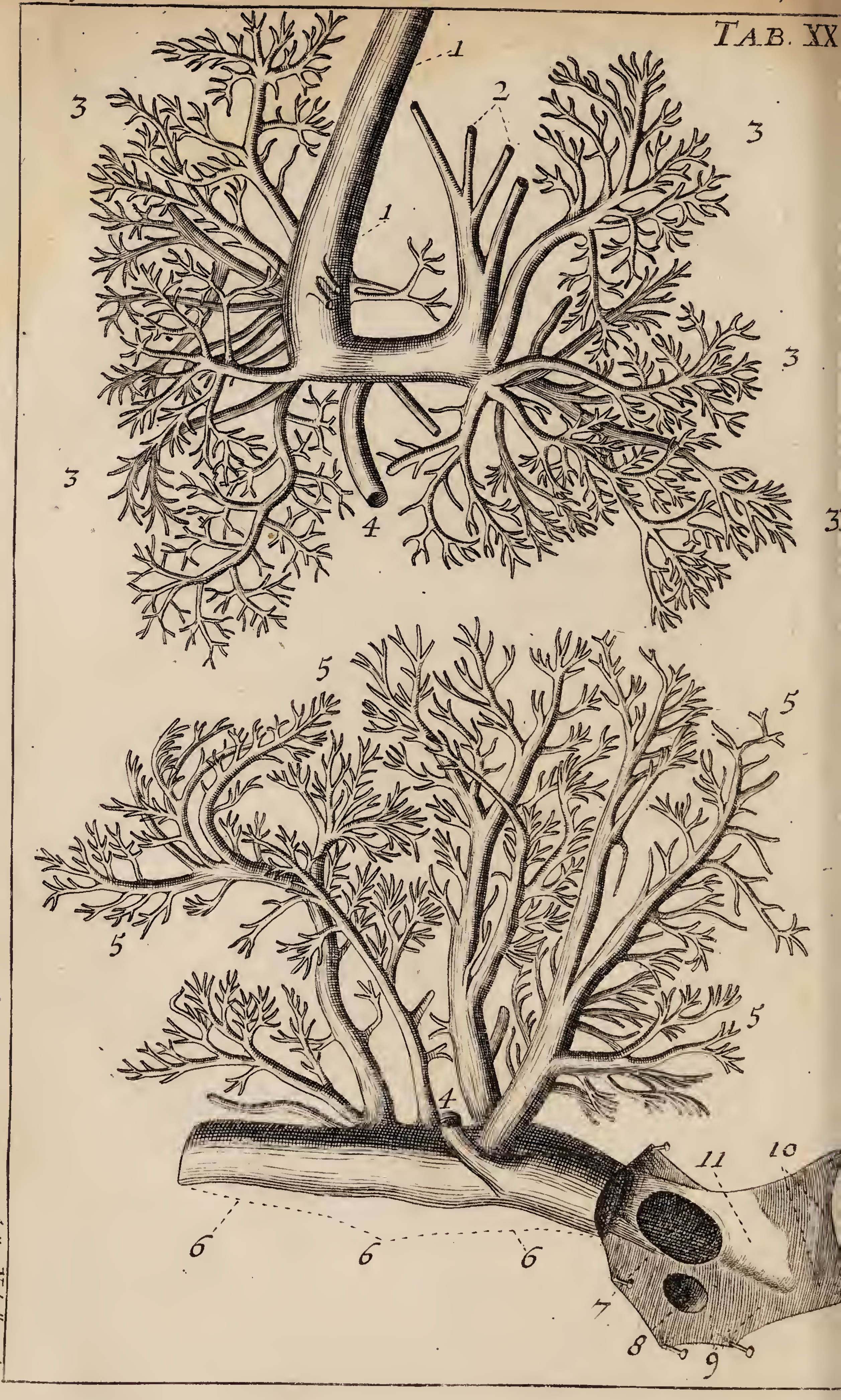
TAB. XX



Sutton Nicholls sculp.

TABLE XXXI.

The veſſels of the liver, &c. of a Fœtus, filled with wax.

1, 1. The umbilical vein.
2. Branches of the Vena Portæ.
3, 3, &c. The extream branches in the liver.
4, 4. The Ductus Venoſus.
5, 5, &c. The extreme branches of the Cava in the liver.
6, 6, 6. The aſcending Vena Cava.
7. The Foramen Ovale.
8. The mouth of the coronary veins.
9. Part of the right auricle of the heart.
10. Part of the deſcending Cava.
11. Tuberculum Loweri.

TABLE XXXII.

SHEWS how all the rays that flow from any point of any object, through the pupils of the eyes, are refracted by the cryſtalline humour, to meet in a Focus upon the Retina; the two dark cones ſhew the ſpaces where any object being placed, it is not perceived in that eye in which the cone ends; becauſe all the rays of light from an object ſo placed, fall upon the entrance of the optic nerve in that eye. (Vid. page 213.) Theſe cones divaricating as they proceed from the eyes, they can never coincide, and conſequently, tho' an object may be from this cauſe undiſcerned by one eye, there is no place from which it will be upon this account undiſcerned by the other eye.

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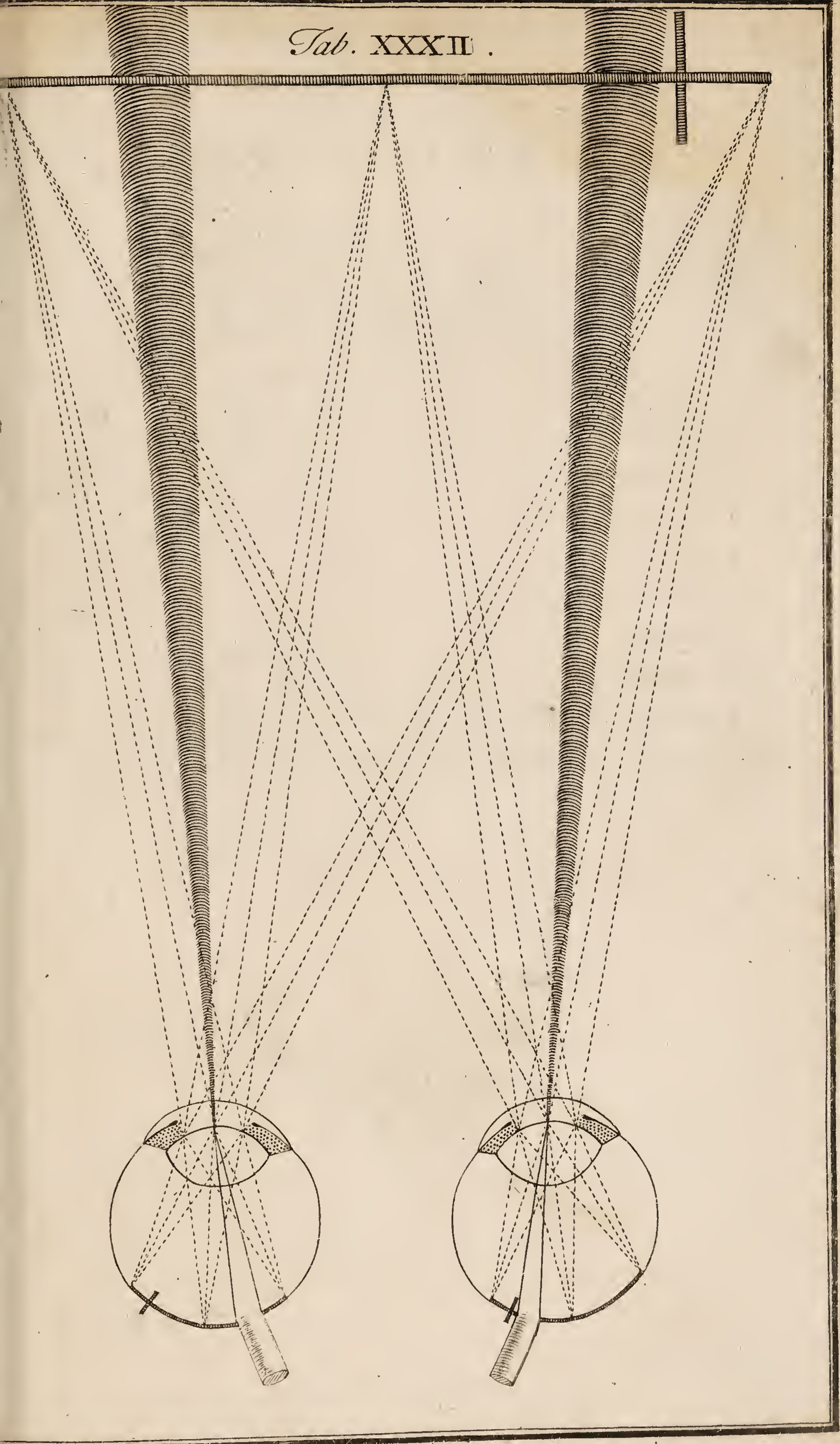
Tab. XXXII.



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Tab. XXXIII.

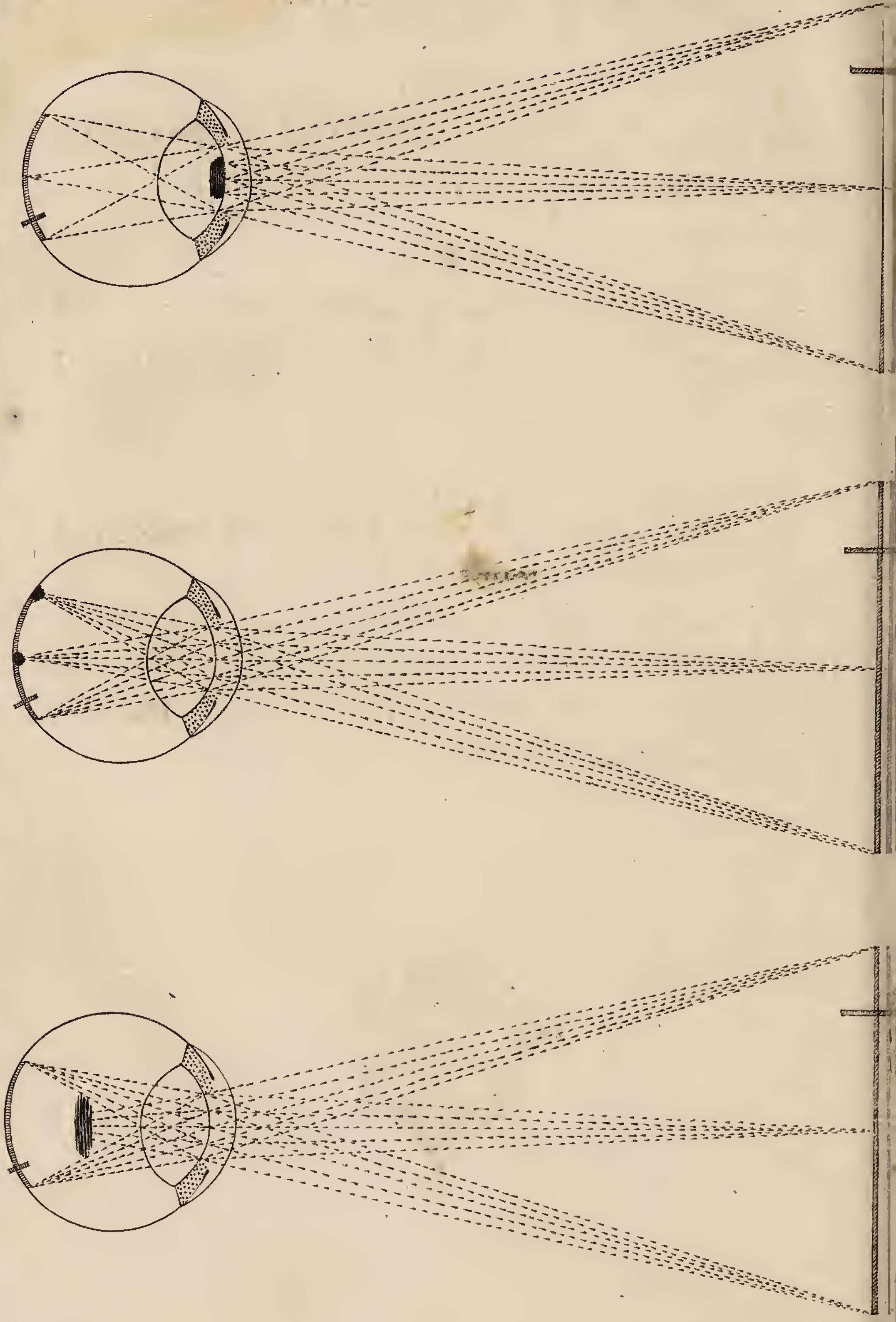


TABLE XXXIII.

Fig. 1

Shews what will be the effect of an opakeneſs, in the forepart of the cryſtalline humour.

Fig. 2

Shews what will be the effect, when parts of the Retina are not ſenſible of the light that falls upon them.

Fig 3.

Shews what will be the effect of opakeneſs in the vitreous humour.

By conſidering the effects of diſeaſes within the eyes in this manner, the ſituation and extent of a diſeaſe in the eyes may, in moſt caſes, be known to great exactneſs.

TABLE XXXIV.

FIG. 1

SHEWS how the light may be perceived only ſide-ways, when as much of the Tunica Cornea is become opake as lies before the pupil.

FIG. 2

SHEWS how it happens that in the caſe of a cataract, which is a diſeaſe in the cryſtalline humour, light is perceived ſide-ways after viſion is quite loſt forwards.

Fig. 1

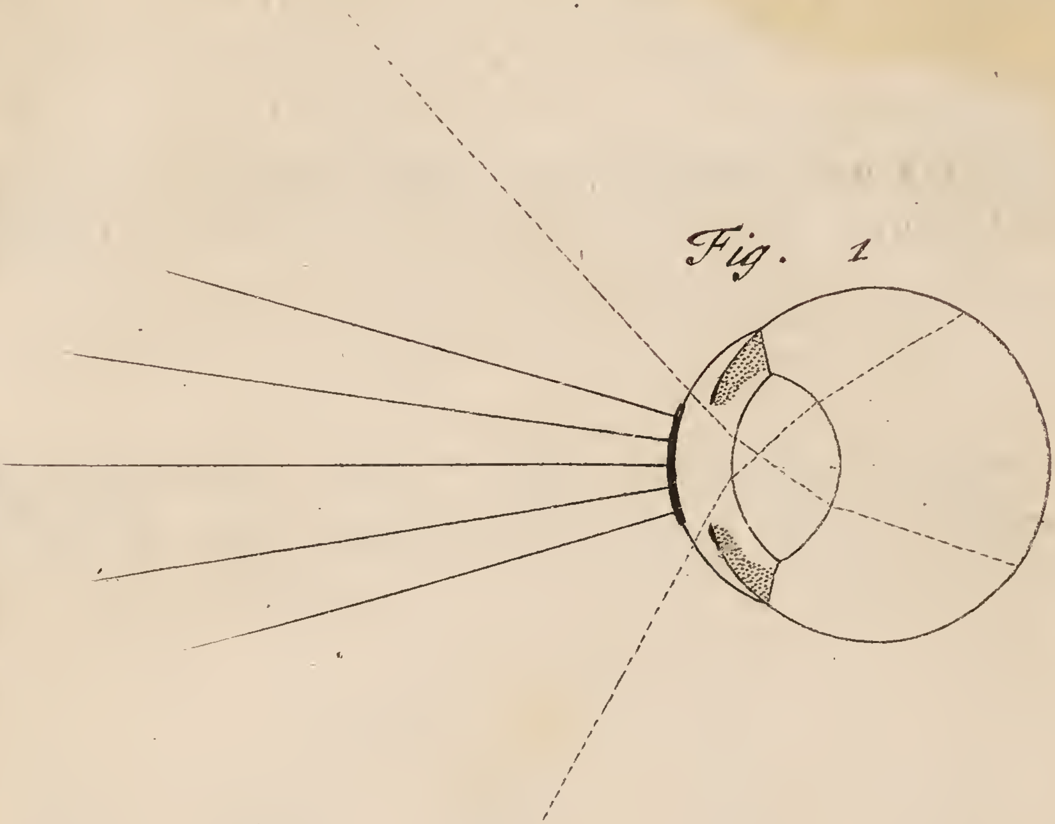
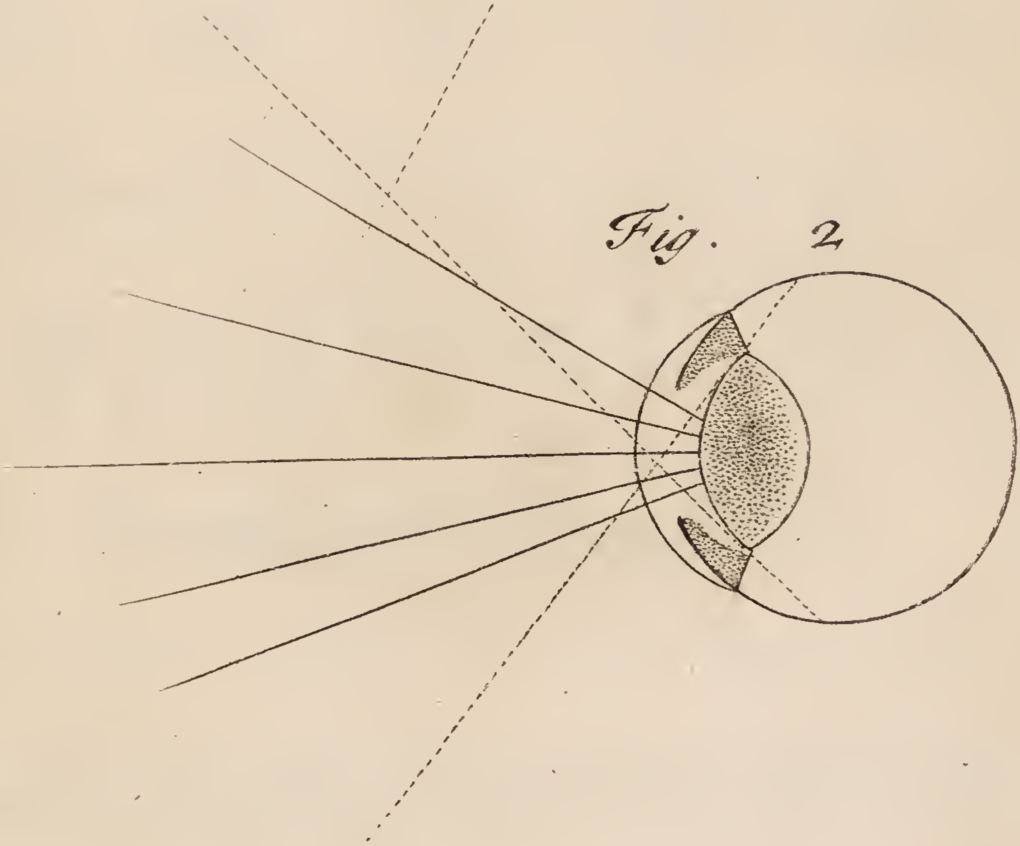


Fig. 2



SYLLABUS,

SIVE

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Humani Corporis partium præcipuarum

ANATOMICUS,

In xxxv Prælectiones diſtinctus.

OSTEOLOGIA.

Prælectio Prima.

De Articulationibus & Structura Oſſium.

- Diarthroſis
  - Enarthroſis.
  - Ginglimus.
- Synchondroſis.
- Synarthroſis,
  - Sutura.
  - Gomphoſis.

Prælectio Secunda.

De Oſſium textura, Membraniſque, &c.

- In Textura ſunt obſervanda
  - Fibræ.
  - Partes
    - compactæ.
    - ſpongioſæ.

- Membranæ,
  - Pericranium.
  - Perioſteum.
  - Glanduloſæ Cellulas inveſtientes.
  - Medullam continentes.

- Medulla
  - adipoſa.
  - ſanguinea.
- De
  - Epiphyſibus, & Apophyſibus in genere.
  - Introitu & exitu Vaſorum.
  - Oſſium nutritione & incremento.

Prælectio Tertia.

De Suturis & Oſſibus Cranii.

- Sutura
  - Coronalis.
  - Sagittalis.
  - Lambdoidalis.——*Oſſa Triquetra.*
  - Squamoſa.
  - Tranſverſalis.

Cæteræ ab Oſſibus, quæ circumagunt, nominantur.

OS,

- Bregmatis.
- Frontis,
  - Spina.
  - Foramina.
  - Sinus.
- Ethmoides,
  - Criſta Galli.
  - Foramina.
- Sphenoides,
  - Proceſſus
    - Pterygoides
      - externus.
      - internus.
    - Innominatus.
    - Salpingoides.
    - Clinoides.
  - Sella Turcica.
  - Foramen
    - primum.
    - ſecundum, vel lacerum.
    - tertium.
    - quartum.
    - quintum.
  - Sinus Sphenoidalis.

- Temporis,
  - Proceſſus Mammillaris.
  - Proceſſus e quo fit Os Jugale dictum.
- Petroſum,
  - Foramen
    - ſextum.
    - ſeptimum.
  - Proceſſus Styliformis.

Meatus auditorius, &c. *Vide, de Organis Auditus,* Præl. xxv.

Foramen octavum.

- Occipitis,
  - Foramen
    - nonum.
    - decimum, vel magnum.
  - Apophyſes duæ.

Foramina quædam Innominata.

Prælectio Quarta.

De Oſſibus Faciei, & Maxillarum, &c.

OS,

Naſi.
Unguis,——ductus ad Naſum.
Planum.
Malæ vel Zygoma.
Palati,——Foramina.
Vomer.
Spongioſum & ſeptum Naſi quid.

- Maxilla
  - Superior,
    - Alveoli.
    - Foramina.
    - Antrum.
  - Inferior,
    - Proceſſus
      - Condyloides.
      - Coronalis.
      - Innominatus.
    - Foramina.
    - Alveoli.

Dentes
- Inciſorii.
- Canini.
- Molares.
- Sapientiæ.

Prælectio Quinta.

De Oſſibus Trunci Corporis.

Spina, ejus Vertebræ.
- Colli 7. Atlas prima. Dentata ſecunda. Proceſſ. dentatus.
  - partes anteriores ſpongioſæ.
  - Proceſſus
    - Obliqui
      - ſuperiores.
      - inferiores.
    - Spinales bifurcati.
    - Tranſverſ. perforati.
- Dorſi 12. Lumborum. 5.
  - partes anteriores ſpongioſæ.
  - Proceſſus
    - Obliqui
      - ſuperiores.
      - inferiores.
    - Spinales.
    - Tranſverſales.
- Sacri 5, vel 6.
  - Spinæ.
  - Foramina.
  - Proceſſus obliqui ſuperiores.
- Coccygis 4, vel 5.

Coſtæ 12.
- veræ 7.
- nothæ 5.
- Apophyſes, & Sulci.

Sternum
- Oſſa Pectoris, plerumque tria.
- Cartilago enſiformis.
- Cartilagines ad Coſtas.

Os Hyoides.

Prælectio Sexta.

De Oſſibus artus ſuperioris.

OS,
Clavicula.

Scapula,
- Acetabulum.
- Proceſſus
  - Coracoides.
  - Acromion.
- Coſta
  - Superior.
  - Inferior.
- Spina.
- Baſis.

Humeri,
- Caput.
- Apophyſis ſuperior.
- Sulcus.
- Apophyſis
  - externus,
  - internus,
  - inferior.
- Sinus.

Ulna,
- Olecranon.
- Proceſſus Styloides.

Radius, ——— Tuberculum.

Carpi
- primi
- ſecundi
- ordinis 4.

Metacarpi 4.
Pollicis 3.
Digitorum 12.

Prælectio Septima.

De Oſſibus artus inferioris.

OS,

- Innominatum,
  - Ilium,
    - Spina.
    - Apex.
  - Iſchium—Proceſſus
    - obtuſus.
    - acutus.
  - Pubis.
  - Acetabulum.
  - Foramen.
- Femoris,
  - Caput.
  - Trochanter
    - major.
    - minor.
  - Linea aſpera.
  - Apophyſes inferiores.
- Patella.
- Tibia, Apophyſes.
- Fibula,——Appendix
  - ſuperior.
  - inferior.
- Tarſi 7.
  - Aſtragalus.
  - Calcaneum.
  - Cuboides.
  - Naviculare.
  - Cuneiforme
    - majus.
    - medium.
    - minimum.
- Metatarſi 4.
- Pollicis pedis 3.
- Digitorum pedis 12.
- Seſamoidea.

Prælectio Octava.

De Ligamentis, & Cartilaginibus Capita oſſium inveſtientibus, & Glandulis Oſſium, juncturis inſervientibus: Etiam de his quibus Sceleton Viri, & Fœminæ Fœtus, & Adulti differunt.

De
- Ligamentis in genere.
- Ligamento terete.
- Cartilaginibus in genere.
- Glandulis juncturas lubricantibus.

ENTEROLOGIA.

Prælectio Nona.

De quibuſdam Partium externarum integumentiſque & Partibus conſtituentibus.

Mammæ, { Papillæ.
  Areolæ.
Scrobiculus Cordis.
Regio Umbilicalis.
Hypochondria.
Hypogaſtrium.

Cæteræ partes externæ propriis Prælectionibus ſunt demonſtrandæ.

Cuticula.
Reticulum mucoſum.
Cutis, { Papillæ Pyramidales.——Ungues.
  Bulbi, unde procedunt——Pili.
Glandulæ miliares, vel ſudoriferæ.
Membrana adipoſa.

Fibra.
Membrana.
Arteria.
Vena.
Lymphæductus.

Nervus.
Glandula.
Vas { Lacteum.
  Excretorium.

Muſculus.
Tendo.
Os.
Cartilago.
Ligamentum.

Prælectio Decima.

De Membranis totius Corporis.

Dura Mater.
Pia Mater.
Mediaſtinum.
Pleura.
Peritoneum, *&c.*

Prælectio Undecima.

De Glandulis ſalivalibus, earumq; ductibus.

Parotides, vel Maxillares ſuperiores.
Maxillares inferiores.
Sublinguales.
Tonſillæ.
} earum ductus.

Membrana Glandularis oris, cujus Glandulæ nominantur {
Buccales.
Labiales.
Linguales.
Fauciales.
Palatinæ.
Uvulares.

Prælectio Duodecima.

De Ductu Alimentali, & Membranis in Abdomine.

Peritoneum ——— Vaſa Umbilicalia. *Vide* Præl. xxii.

Omentum,
- Ala,
  - ſuperior.
  - inferior.
- Burſa.

Œſophagus.

Ventriculus, — orificum
- ſiniſtrum, Cardia.
- dextrum, ubi circulus fibroſus.

Inteſtina tenuia,
- Duodenum.
- Jejunum.
- Ilium.

Inteſtina craſſa,
- Colon, ubi Valvulæ ad ingreſſum.
- Cæcum.
- Rectum.

In omni parte ductûs Alimentalis eſt notanda,

Tunica
- externa, Communis.
- media, Muſcularis.
- interna, Glanduloſa, Villo obducta.

In
- Ventriculo flaccido, Rugæ.
- Inteſtinis
  - tenuibus, Valvulæ Conniventes.
  - craſſis, Cæco excepto,
    - Ligamenta.
    - Glandulæ.
    - Valvulæ.

Meſenterium, — Glandulæ
- Majores, *in Canibus Pancreas Aſſellii.*
- Minores.

In omnibus his Membranis, ſunt obſervandæ Lamellæ.

Prælectio Decima Tertia.

De Hepate, Pancreate, Splene & Via lactea.

- Hepar,
  - Ligamentum
    - Suſpenſorium.
    - Latum.
    - Umbilicale.
  - Vena
    - Porta.
    - Cava.
  - Ductus Venoſus.
  - Veſica Fellea.
  - Vaſa excretoria,
    - Ductus
      - Cyſticus.
      - Hepaticus.
      - Communis.
      - Choledochus.
- Pancreas —— Ductus excretorius.
- Splen,
  - Rete.
  - Cellulæ.

Prælectio Decima Quarta.

De quibuſdam Glandulis, & de Vaſis lacteis & lymphaticis.

- Venæ lacteæ,
  - primi generis.
  - ſecundi generis.
- Receptaculum chyli.
- Ductus Thoracicus.
- Lymphæductus in genere.
- Glandulæ
  - Vaſa ubique concomitantes.
  - Inguinales.
  - Axillares.

Prælectio

Prælectio Decima Quinta.

De Corde, & partibus Reſpirationi inſervientibus.

- Larynx, —— Cartilago
  - Thyroides.
  - Cricoides.
  - Arytænoides.
  - Epiglottis.
- Bronchos, —— Cartilagines, Pene-anulares.
- Glandulæ Thyroideæ.
- Thymus.
- Pleura.
- Mediaſtinum.
- Pulmones,
  - Lobi.
  - Lobuli.
- Pericardium.
- Cava
  - deſcendens.
  - aſcendens.
- Tuberculum Loweri.
- Cor
  - Auricula dextra
    - Columnæ.
    - Foraminis ovalis locus.
    - Oſtium Venarum coronariarum.
  - Ventriculus dexter,
    - Valvulæ tricuſpides.
    - Papillæ.
    - Columnæ.
  - Arteria Pulmonalis,
    - Valvulæ ſigmoidales.
    - Canalis arterioſus in Ligamentum verſus.
  - Vena Pulmonalis.
  - Auricula ſiniſtra, —— Columnæ.
  - Ventriculus ſiniſter,
    - Valvulæ mitrales.
    - Papillæ.
    - Columnæ.
  - Septum Cordis.

Aorta,
- Valvulæ ſemilunares.
- Oſtia Arteriarum coronariarum.

Prælectio Decima Sexta.

De Arteriis & Venis ſuperioribus.

ARTERIÆ.

Aorta aſcendens.
Coronariæ Cordis.
Subclaviæ.
Thymæ.
Mammariæ.
Cervicales.
Carotides.
Thyroideæ.
Laryngeæ.
Temporales.
Occipitales.
Parotides.
Ranulæ.
Faciei.

VENÆ.

Jugulares,
- externæ.
- internæ.

Rami communicantes.
Ranulares.
Faciei.
Parotides.
Laryngeæ.
Thyroideæ.
Mammariæ.
Thymæ.
Occipitales.
Cervicales.
Subclaviæ.
Cava deſcendens.

Vaſa Cerebri. *Vide* Præl. xviii.

Axillaris.
Humeralis.
Cubitalis
- ſuperior.
- media.
- inferior.

Ramus communicans.
Digitales.

Digitales.
Cephalica.
Mediana.
Baſilica.
Humeralis.
Axillaris.

Prælectio Decima Septima.

De Arteriis, & Venis inferioribus.

ARTERIÆ.

- Aorta deſcendens.
- Intercoſtales.
- Bronchiales.
- Phrenicæ.
- Cœliaca.
- Pancreatica.
- Hepatica.
- Cyſtica.
- Coronaria Ventriculi ſuperior.
- Epiploicæ.
- Splenica.
- Coronaria Ventriculi inferior.
- Meſenterica ſuperior.
- Emulgentes.
- Spermaticæ.
- Lumbares.
- Meſenterica inferior.
- Rami communicantes.
- Sacra.
- Iliaca
  - externa.
  - interna.
- Epigaſtricæ.
- Cruralis.
- Tibialis
  - anterior.
  - media.
  - poſterior.
- Ramus communicans.
- Digitales Pedis.

VENÆ.

- Digitales Pedis.
- Saphena.
- Tibiales.
- Popliteæ.
- Cruralis.
- Epigaſtricæ.
- Iliaca
  - externa.
  - interna.
- Lumbares.
- Spermaticæ.
- Emulgentes.
- Meſeraicæ.
- Coronaria Ventriculi inferior.
- Splenica.
- Epiploicæ.
- Coronaria Ventriculi ſuperior.
- Cyſtica.
- Hepatica.
- Pancreatica.
- Porta.
- Phrenicæ.
- Intercoſtales.
- Bronchiæ.
- Azygos in Cavam deſcendentem.
- Cava aſcendens.
- Earum Valvæ.

Tunicæ, & Vaſa Vaſorum.

Prælectio

Prælectio Decima Octava.

De Cerebro, ejuſque Membranis, & Vaſis.

- Dura Mater
  - Proceſſus
    - primus, *(i. e.)* Falx.
    - ſecundus.
    - tertius.
  - Sinus
    - Longitudinalis
      - ſuper.
      - infer.
        - ubi Ligamenta.
        - Torcular Herophili.
    - Laterales.
    - Rectus.
    - Circularis.
    - Innominati.

Cæteri non ſunt ſemper obſervandi.

- Pia Mater
  - Arteriæ.
  - Venæ.
  - Valvulæ.
- Cerebrum.
  - Hemiſphæra 2.
  - Lobi 4.
  - Arteriæ
    - Carotides.
    - Cervicales.
  - Infundibulum.
  - Glandula pituitaria.
  - Protuberantiæ 2. albæ pone infundibulum.
  - Medulla oblongata,
    - Crura.
    - Caudex.
    - Protuberantia annularis.
  - Nervorum par
    - 1
    - 2
    - 3
    - 4
    - 5
  - ſeu
    - Olfactorium.
    - Opticum.
    - Oculorum motorium.
    - Patheticum.
    - Guſtatorium.

Cerebrum. Nervorum par
- 6
- 7 ſeu Auditorium.
- 8 ſeu vagum.
- 9 Acceſſorius Recurrens.
- 10

Cerebellum, — Proceſſus vermiformes.

Subſtantia
- Corticalis cinerea.
- Medullaris alba.

Septum lucidum.

Fornix,
- Radices.
- Crura.

Ventriculi 2 anteriores, —
- Plexus Choroides.
- Glandula Pinealis.
- Corpora ſtriata.
- Thalami Nervorum opticorum.
- Nates.
- Teſtes.

Foramen
- ad Radices Fornicis.
- anterius.
- poſterius.

Ventriculus tertius.

Ventriculus quartus.
- Valvula.
- Pedunculi.

Quod de Cerebro ſupereſt vix notatu dignum judico.

Prælectio Decima Nona.

De Medulla Spinali & Nervis paſſim in Corpore diſperſis.

Medulla Spinalis
- Meninges.
- Cauda Equina.
- Nervor. pares.
  - Cervicis 7.
  - Dorſi 12.

- Medulla Spinalis
  - Nervor. pares.
    - Lumborum 5.
    - Sacri 6.

Brachiales.
Cubitales.
Digitales.
Intercoſtales.

- Cruralis
  - anticus.
  - poſticus.

Tibiales.
Digitorum pedis.

Sunt plurimi ex his oriundi, & per Corpus undique diſperſi; & a partibus quibus ſubſerviunt nominantur.

Prælectio Vigeſima.

De Partibus Urinariis, & Organis generationis in Viris.

- Renes,
  - Arteriæ } emulgentes.
  - Venæ } emulgentes.
  - Glandulæ.
  - Papillæ.
  - Tubuli Urinarii.
  - Pelvis.

Glandulæ Renales. —— Sinus.
Ureteres.

- Veſica urinaria, Tunica
  - Externa communis.
  - Media, *Muſculus detruſor urinæ.*
  - Interna,

- Teſtes,
  - Tunicæ
    - Communes,
      - externa, Cutis.
      - interna, Dartos.
    - Propriæ
      - externa, Proceſſus Elythroides.
      - interna, Albuginea.
  - Arteriæ
  - Venæ
    - Spermaticæ,
  - Corpora varicoſa.
  - Epididymes.
- Vaſa deferentia.
- Veſiculæ ſeminales.
- Proſtatæ.
- Penis,
  - Glans,
    - Præputium.
    - Frœnum.
    - Corpora cavernoſa.
    - Glandulæ odoriferæ.
  - Crura.
  - Corpora cavernoſa.
  - Septum.
  - Connexio ad Oſſa pubis, *(i.e.)* Ligamenmentum ſuſpenſorium.
  - Urethra.
    - Corpus cavernoſum.
    - Roſtra Gallinaginis.
    - Membrana Glanduloſa.

Muſculi: *Vide* Præl. xxvi.

Prælectio Vigeſima Prima.

De Partibus Generationis Mulierum.

- Externæ,
  - Mons Veneris.
  - Rima Magna.
  - Labia.
  - Nymphæ.
  - Clitoris,
    - Glans.
    - Præputium.
    - Crura.
    - Corpora cavernoſa.
  - Meatus Urinarii exitus.
- Vagina,
  - Hymen.
  - Carunculæ myrtiformes.
  - Rugæ.
  - Glandulæ.
  - Lacunæ.
- Uterus,
  - Ligamenta.
  - Os Tincæ.
- Tubæ Falloppianæ,
  - Fimbriæ.
  - Foramina.
- Ovaria,
  - Arteriæ } ſpermaticæ.
  - Venæ } ſpermaticæ.
  - Corpora varicoſa.
  - Ova.

Prælectio Vigeſima Secunda.

De Fœtu in Utero, cum Membranis, &c.

- Membrāna
  - Chorion.
  - Allantois.
  - Amnion.

Humores.
Placenta Uterina.
Vaſa Umbilicalia, { Vena. Arteriæ. Urachus.
Ductus venoſus.
Foramen ovale.
Ductus arterioſus.

Prælectio Vigeſima Tertia.

De Organis Tactus, Guſtus, & Odoratus.

TACTUS.

Papillæ pyramidales in Cute. *Vide Præl.* ix.

GUSTUS.

Papillæ pyramidales in Lingua.

ODORATUS.

Membrana Glanduloſa, & Nervea, paſſim inducta in Laminas Naſi, commune Os ſpongioſum dictum.

Prælectio Vigeſima Quarta.

De Organis Viſus.

Palpebræ cum Ciliis, & Superciliis.
Caruncula lachrymalis.
Ductus lachrymales.

- Tunica
  - Conjunctiva.
  - Sclerotis.
  - Cornea.
  - Choroides.
  - Uvea.
  - Retina.
  - Aranea.
- Proceſſus Ciliares.
- Iris.
- Pupilla.
- Humores,
  - Aqueus.
  - Vitreus.
  - Cryſtallinus.

Prælectio Vigeſima Quinta.

De Organis Auditus.

- Auricula.
- Meatus Auditorius. — Membrana Glanduloſa.
- Iter ad Palatum.
- Tympanum.
- Membrana Tympani.
- Feneſtra
  - ovalis.
  - rotunda.
- Veſtibulum.
- Labyrinthus.
  - Cochlea.
  - Canales tres ſemicirculares.
- Oſſa,
  - Incus.
  - Stapes.
  - Malleolus.
  - Oſſiculum quartum.
- Muſculus
  - externus, Tympani laxator.
  - extenſores.
    - Obliquus internus
    - Obliquus externus
  - Stapedis.

MYOLOGIA.

Prælectio Vigeſima Sexta.

De Muſculis Abdominis, &c.

Faſcia tendinoſa, *vulgo* Membrana communis Muſculorum.

Membrana propria.

ABDOMINIS.

Obliqui { deſcendentes.
          aſcendentes. }
Pyramidales, — *ſæpe deſunt.* } Compreſſores.
Recti, — flexores.
Tranſverſales. }
Cremaſteres Teſtium.
Erectores Penis.
Acceleratores Urinæ.
Erectores Clitoridis.
Sphincter Vaginæ.
Sphincter Ani.
Levatores Ani.

Prælectio Vigeſima Septima.

De Muſculis Faciei, Oculi, &c.

FRONTIS.

Occipito-Frontalis.
Retractor Auriculæ.

PALPEBRARUM.

Orbicularis.
Ciliaris, *eſt portio prioris.*
Aperiens Palpebram ſuperiorem rectus.

OCULI.

Elevator.
Depreſſor.
Adductor.
Abductor.
Obliquus { ſuperior, ſeu Trochlearis.
{ inferior.

FACIEI.

Sphincter Oris.
Elevator } Labii ſuperio- { Dilatator } alarum
Depreſſor } ris proprius eſt { Conſtrictor } Naſi.
Elevator } Labii inferioris proprius.
Depreſſor }
Elevator } Labiorum communis.
Depreſſor }
Zygomaticus.
Buccinator.
Platyſma Myoides.

Prælectio Vigeſima Octava.

De Muſculis Oſſis Hyoidis, Linguæ, & Laryngis.

OSSIS HYOIDIS.

Mylohyoidei, Geniohyoidei, } ſurſum, antrorſumque.
Stylohyoidei,——ſurſum, retrorſumque.
Coracohyoidei,——deorſum, retrorſumque.
Sternohyoidei,——deorſum.

LINGUÆ.

Genioglosſi,——ſurſum, antrorſumque.
Stylogloſſi,——ſurſum, retrorſumque.
Ceratogloſſi, Baſiogloſſi, } deorſum.

LARYNGIS.

Hyothyroidei,——elevatores } Thyroidis.
Sternothyroidei, Cricothyroidei, } depreſſores. } Thyroidis.
Cricoarytœnoidei, { poſtici, laterales, } apertores } Arytœnoidis.
Thyroarytœnoidei, } apertores } Arytœnoidis.
Arytœnoidei——clauſores.

Prælectio

Prælectio Vigeſima Nona.

De Muſculis Maxillæ inferioris, Pharyngis, & Uvulæ.

MAXILLÆ INFERIORIS.

Digaſtricus,——depreſſor.

Maſſeteres,		elevatores.
Temporales,		
Pterygoidei	externi, interni,	

PHARYNGIS.

Stylopharyngei,——dilatatores.
Œſophagei,——conſtrictores.
Vaginalis Gulæ.

UVULÆ.

Pterygoſtaphylini	externi,	——deorſum,
	interni,	——ſurſum.

Gloſſoſtaphylini.

Prælectio Trigeſima.

De Muſculis Claviculæ, Scapulæ, Humeri, & Cubiti.

CLAVICULÆ.

Subclavius.

SCAPULÆ.

Trapezius——retrorſum.
Elevator.
Rhomboides, ſurſum, retrorſumque.

Serratus { major } anti- { antrorſum, ſurſumque.
{ minor } cus, { antrorſum,deorſumque.
Pectoralis,———antrorſum.
Deltoides, }
Supraſpinalis, } ſurſum.
Infraſpinalis, retrorſum.
Teres { major.
{ minor *eſt por Muſc. infraſp.* } retrodeorſum.
Latiſſimus Dorſi. }
Coracobrachialis,———ſurſum, extrorſumque.
Subſcapularis,———introrſum.

CUBITI.

Biceps, }
Brachialis, } Flexores.
Triceps, }
Anconeus, } Extenſores.

Prælectio Trigeſima Prima.

De Muſculis Volæ Manus, Carpi, Pollicis, Digitorum, & Radii.

VOLÆ MANUS.

Palmaris { longus, *ſæpe deeſt.*
{ brevis, ſeu caro quadrata.

CARPI.

Flexor { Radialis.
{ Ulnaris.
Extenſor { Radialis, ſeu Bicornis.
{ Ulnaris.

Pollicis.

POLLICIS.

Extenſor { primi ſecundi tertii } internodii.
Flexor { primi, & ſecundi Oſſis. tertii internodii. }
Adductor.
Abductor.

DIGITORUM.

{ Perforatus,——ſecund. Perforans,——tert. Lumbricales,——primi } internod. flexor.
Extenſor { Communis. Indicis. Auricularis. }
Abductor { primi minimi } digiti.
Flexor Oſſis Metacarpi minimi digiti.
Interoſſei,——extenſores, & divaricatores.

RADII.

Supinator { longus flexor verus cubiti. brevis. }
Pronator { teres. quadratus. }

Prælectio Trigeſima Secunda.

De Muſculis Capitis, & Colli.

CAPITIS.

Maſtoidei,
interni majores
Recti minores flexores.
laterales—utrinque.

COLLI.

Longi,——flexores.
Scaleni.
Intertranſverſales.

CAPITIS.

Splenii.
Complexi.
Recti majores extenſores.
minores
Obliqui ſuperiores
inferiores.—rotatores.

COLLI.

Spinales
Tranſverſales extenſores.
Interſpinales

Prælectio Trigeſima Tertia.

De Muſculis Dorſi, Lumborum, & Coſtarum.

DORSI.

Sacrolumbales,
Longiſſimi, extenſores.
Semiſpinales,

LUMBORUM.

Pſoas parvus,——flexor *ſæpe deeſt.*
Quadrati,——utrinque.
Coccygei.

COSTARUM.

Serrati {ſuperiores, inferiores,} poſtici {levatores. depreſſores.}
Intercoſtales {externi, interni,} levatores.
Triangulares, Diaphragma, } conſtrictores.

Prælectio Trigeſima Quarta.

De Muſculis Femoris, & Tibiæ.

FEMORIS.

Pſoas magnus, Iliacus internus, Pectineus, Triceps, } flexores.
Gluteus {maximus, medius, minimus,} extenſores.
Pyriformis, Marſupialis, } ſeu {Iliacus externus, Obturator internus,} Quadratus. Obturator externus. } rotatores.

TIBIÆ.

Membranoſus,——extenſor extrorſum.
Sartorius, Gracilis, } flexor introrſumque.
Semitendinoſus, Semimembranoſus, Biceps, Popliteus, } flexores.

Rectus,
Vaſtus, externus,
internus, extenſores.
Crureus,

Prælectio Trigeſima Quinta.

De Muſculis Tarſi, Pollicis, & Digitorum Pedis.

TARSI MUSCULI.

Gaſtrocnemius externus,
Plantaris *ſæpe deeſt* extenſores.
Gaſtrocnemius internus,

Tibialis anticus,—flexor
poſticus,—extenſor introrſum.

Peroneus longus,
brevis, extenſores extrorſum.

POLLICIS PEDIS.

Extenſor longus.
brevis.

Flexor longus.
brevis.

Abductor.
Adductor.

DIGITORUM PEDIS.

Extenſor longus.
brevis.

Interoſſei—extenſores.
Perforatus, —ſecund.
Perforans,—tert: internod. flexores.
Lumbricales,—prim.
Tranſverſalis Pedis——conſtrictor.

FINIS.

AN
APPENDIX
TO THE
FOURTH EDITION
OF THE
ANATOMY
OF THE
HUMAN BODY.

APPENDIX.

CHAP. I.

A ſhort hiſtorical account of cutting for the ſtone.

THE moſt ancient way of cutting for the ſtone, is that deſcribed by Celſus, now called cutting by the gripe, or the leſſer apparatus; and as Celſus relates, was not performed in his time but upon boys between nine and fourteen years of age. But Roſſet, in his treatiſe de partu Ceſareo ſays, he thinks this muſt be a miſtake in the manuſcript from which Celſus was printed, ſeeing younger boys are well known to be much fitter ſubjects for that operation: But this way of operating is very difficult in men, and perhaps attended with inconveniencies if it has ever been practiſed, that the operators have not thought fit to publiſh.

In the year 1524 Marianus publiſhed the method of cutting by the greater Apparatus, (now commonly called the old way) which was invented by his maſter Johannes de Romanis; this operation has one advantage over the former, that it may be done conveniently upon men full grown.

In the year 1697 Frere Jacques came to Paris (as Mery and others have related) to practiſe his new invented way of cutting for the ſtone, which he declared to be directly into the bladder, and which he had performed with ſo great reputation, that the king ordered him to cut in both the hoſpitals, where though ſome of his patients recovered ſurpriſingly, yet the major part miſcarrying, his operation fell preſently into diſgrace. Upon opening theſe unhappy patients (as Mery and others relate) in ſome the bladders were found cut through, and wounded in many places; in ſome the neck of the bladder totally divided, and in others the Inteſtinum Rectum miſerably cut, which upon the whole ſufficiently ſhewed, that the ill ſucceſs of this operation was not owing to the nature of it, but the operator's ignorance in anatomy, as they themſelves inſinuate.

In the year 17$\frac{17}{18}$ Doctor James Douglaſs, in a paper preſented to the Royal Society, demonſtrated from the anatomy of the parts, that the high operation for the ſtone might be practiced;

(which had been once performed by Franco injudiciouſly, and by him diſrecommended, though his patient recovered; and afterwards ſtrongly recommended, but not practiſed by Roſſet.) Yet no one undertook it, till his Brother Mr. John Douglaſs about three Years after performed it, and with great Applauſe, his two firſt patients recovered: Soon after a ſurgeon of St. Thomas's Hoſpital cut two, who both recovered; but the ſame gentleman afterwards cutting two, who miſcarried by the cutting or burſting the Peritoneum, ſo that the guts appeared, this way immediately became as much decryed, as it was before commended; and the Surgeons of St. Bartholomew's Hoſpital who had reſolved to do this operation, altered their reſolution, and went on in the old way. The next ſeaſon it being my turn in St. Thomas's, I reſumed the high way, and cutting nine with ſucceſs, it came again in vogue; after that every Lithotomiſt of both Hoſpitals performed it; but the Peritoneum being often cut or burſt, (twice in my practice) though ſome of theſe recovered, and ſometimes the bladder it ſelf was burſt from injecting too much water, which generally proved fatal in a day or two. Another inconvenience attended every operation of this kind, which was, that the Urine's lying continually in the wound ſometimes made ſloughs, and always retarded the cure; but then it was never followed with an incontinence of urine; what the ſucceſs of the ſeveral operators was, I will not take the liberty to publiſh; but for my own, excluſive of the two before mentioned, I loſt no more than one in ſeven, which is more than any one elſe that I know of could ſay; whereas in the old way, even at Paris, from a fair calculation of above 800 patients, it appears that more than two in ſeven died. And though this operation came into univerſal diſcredit, I muſt declare it is my opinion, that it is much better than the old way, to which they all returned, except my ſelf, who would not have left the high way but for the hopes I had of a better, being well aſſured that it might hereafter be practiſed with greater ſucceſs; theſe fatal accidents having pretty well ſhewn how much water might be injected, and how large the wound might ſafely be made: But hearing of the great ſucceſs of Mr. Rau, profeſſor of anatomy at Leyden, I determined to try, though not in his manner, to cut directly into the bladder; and as his operation was an improvement of Fryar James, I endeavoured to improve upon him by filling the bladder, as in the high way, with water, leaving the Catheter in, and then cutting on the outſide of the Catheter into the bladder, in the ſame place as upon the gripe, which I could do very readily, and then I took out a ſtone of any ſize with more eaſe than in any other way. I forbear to give a more particular account of the manner of performing this operation, it having been done already as well as is poſſible by Doctor Douglas. My patients for ſome days after the operation ſeemed out of danger, but the urine which came out of the bladder continually lodging upon the cellular membrane on the outſide of the Rectum, made fœtid ulcers, attended with a vaſt diſcharge of ſtinking matter, and from this cauſe I loſt four patients out of ten: The caſe of one which eſcaped was very remarkable; a few days after he was cut, he was ſeized with a great pain in his back and legs, with very little power to move them; upon which he turned upon his face, and reſted almoſt conſtantly upon his knees and elbows above a fortnight together, having no eaſe in any other poſture all that while, at length his urine coming all the right way, his wound ſoon healed, and he recovered the uſe of his back and limbs. I think all theſe ſevere ſymptoms could proceed from no other cauſe than the urine and matter ſomehow offending the great nerves, which come out of the Os Sacrum to go to the lower limbs. I then tried to cut into the bladder, in the ſame manner that Mr. Rau was commonly reported to do, but there had the ſame inconvenience from the urine's lodging upon the cellular membrane on the outſide of the Inteſtinum Rectum. Upon theſe diſappointments I contrived the manner of cutting, which is now called the lateral way.

This operation I do in the following manner. I tie the patient, as for the greater Apparatus, but lay him upon a blanket ſeveral doubles upon an horizontal table three foot high, or a little more, with his head only raiſed. I firſt make as long an inciſion as I well can, beginning near the place where the old operation ends, and cutting down between the Muſculus Accelerator Urinæ, and Erector Penis, and by the ſide of the Inteſtinum Rectum: I then feel for the ſtaff, and cut upon it the length of the proſtrate gland ſtrait on to the bladder, holding down the gut all the while with one or two fingers of my left hand. The reſt of this operation is the ſame as in the old way: But in this way there being often cut ſmall veſſels, I always tie them with a ligature, paſſed under them by the help of a crooked needle.

THE firſt twenty ſeven patients cut this way recovered, and I believe are all living at this time: Indeed I had cut thirty one who recovered before I had one died, having cut four more who recovered between the time the twenty eighth was cut, and the time he died; but I ſcorn to uſe any fallacious way of repreſenting my ſucceſs. Some of theſe being cut in the hoſpital, and ſome privately, the truth of this account may be ſuſpected by thoſe who do not know me. I cannot take the liberty to mention the names of private patients, therefore I will give a detail of thoſe only which I cut this way in the hoſpital, where the firſt twenty five recovered, to the truth of every one of which I had above twenty witneſſes, and I do believe theſe patients are all living at this time.

MARCH 27. 1727.

Robert Kaſon	aged 4
Henry Webb	5
Francis Willſmore	15

APRIL 12. 1727.

Hannibal Baſketfeild	aged 3
Thomas Hull	4
Alexander Montgomery	8
Henry Cope	44

MAY 15. 1727.

Thomas Nailer	7
John Letheridge	8
Daniel Bezely	9

APRIL 8. 1728.

Walter Bromingham	4
William Jerſey	4
Thomas Kennet	13

APRIL

William Davis	4
Thomas Ellis	5
William Adams	6
James Bond	10

MAY 9. 1728.

John Parſon	5
William Chater	11
Wilfrey Peale	40
William Haffenden	67

MAY 25. 1728.

Joſeph Godwin	3
Ellis Bakewell	5

MARCH

MARCH 21. 172$\frac{8}{9}$.

William Ward	aged 10	
John Edwards	15	
Thomas Warren	17	died.
Iſaac Wood	25	

APRIL 21. 1729.

John Payne	4
Thomas March	6
Robert Caruthus	10

APRIL 29. 1729.

Gabriel Forſter.	21
Simon Sutcliffe	36
John Miles	42

MAY 1729.

FOUR cut in the preſence of Monſ. Morand, one of which, named Money, died. The names of the other three I have loſt.

JULY 1. 1730.

Henry Hall	4
Walter Scott	4
John Tooting	7
John Paxter	11
Edward Eilding	13

JULY 31. 1730.

Joſeph Wright	6
Joſhua Philips	7
Richard Michell	10
Daniel Hall	14

In all 46.

Thomas Warren, the firſt who died, had been troubled with the ſtone from his cradle, to the time he was cut, ſeventeen years old; he was very much waſted with pain, and had bad kidneys; he lived free from pain three weeks after he was cut, but his wound never digeſted well.

The other, who died, named Money, had a violent whooping cough. He was removed from the hoſpital for the benefit of the air, and died a fortnight after the operation. Many of the children had the ſmall-pox during their cure, and ſome the meaſles.

* * *

CHAP. II.

An account of ſome Obſervations made by a young gentleman who was born blind, or loſt his ſight ſo early, that he had no remembrance of ever having ſeen, and was couch'd between thirteen and fourteen years of age.

THO' we ſay of this gentleman that he was blind, as we do of all people who have ripe Cataracts, yet they are never ſo blind from that cauſe but that they can diſcern day from night; and for the moſt part in a ſtrong light, diſtinguiſh black, white, and ſcarlet; but they cannot perceive the ſhape of any thing; for the light by which theſe perceptions are made, being let in obliquely through the aqueous humour, or the anterior ſurface of the chryſtaline (by which the rays cannot be brought into a Focus upon the Retina) they can diſcern in no other manner, than a ſound eye can through a glaſs of broken jelly, where a great variety of ſurfaces ſo differently refract the light, that the ſeveral diſtinct Pencils of rays cannot be collected by the eye into to their proper Foci ; wherefore the ſhape of an object in ſuch a caſe cannot be at all diſcerned, though the colour may: And thus it was with this young gentleman, who though he knew theſe colours aſunder in a good light, yet when he ſaw them after he was couch'd, the faint ideas he had of them before, were not ſufficient for him to know them by afterwards, and therefore he did not think them the ſame which he had before known by thoſe names. Now ſcarlet he thought the moſt beautiful of all colours, and of others the moſt gay were the moſt pleaſing, whereas the firſt time he ſaw black it gave him great uneaſineſs, yet after a little time he was reconciled to it; but ſome months after, ſeeing by accident a negro woman, he was ſtruck with great horror at the ſight.

WHEN he firſt ſaw, he was ſo far from making any judgment about diſtances, that he thought all objects whatever touch'd his eyes, (as he expreſs'd it) as what he felt did his ſkin, and thought no objects ſo agreeable as thoſe which were ſmooth and regular, though he could form no judgment of their ſhape, or gueſs what it was in any object that was pleaſing to him: He knew not the ſhape of any thing, nor any one thing from another, however different in ſhape or magnitude; but upon being told what things were, whoſe form he before knew from feeling, he would carefully obſerve, that he might know them again; but having too many objects to learn at once, he forgot many of them; and (as he ſaid)

ſaid) at firſt he learn'd to know, and again forgot a thouſand things in a day. One particular only (though it may appear trifling) I will relate: Having often forgot which was the cat, and which the dog, he was aſham'd to aſk; but catching the cat (which he knew by feeling) he was obſerved to look at her ſtedfaſtly, and then ſetting her down, ſaid, So puſs! I ſhall know you another time. He was very much ſurprized, that thoſe things which he had liked beſt, did not appear moſt agreeable to his eyes, expecting thoſe Perſons would appear moſt beautiful that he loved moſt, and ſuch things to be moſt agreeable to his ſight, that were ſo to his taſte. We thought he ſoon knew what pictures repreſented, which were ſhew'd to him, but we found afterwards we were miſtaken; for about two months after he was couch'd he diſcover'd at once they repreſented ſolid bodies, when to that time he conſider'd them only as party-colour'd planes, or ſurfaces diverſified with variety of paint; but even then he was no leſs ſurprized, expecting the pictures would feel like the things they repreſented, and was amaz'd when he found thoſe parts, which by their light and ſhadow appear'd now round and uneven, felt only flat like the reſt, and aſk'd which was the lying ſenſe, feeling, or ſeeing?

BEING ſhewn his father's picture in a locket at his mother's watch, and told what it was, he acknowledged a likeneſs, but was vaſtly ſurprized; aſking, how it could be, that a large face could be expreſs'd in ſo little room, ſaying, it ſhould have ſeemed as impoſſible to him, as to put a buſhel of any thing into a pint.

At firſt, he could bear but very little ſight, and the things he ſaw, he thought extremely large; but upon ſeeing things larger, thoſe firſt ſeen he conceiv'd leſs, never being able to imagine any lines beyond the bounds he ſaw; the room he was in he ſaid, he knew to be but part of the houſe, yet he could not conceive that the whole houſe could look bigger. Before he was couch'd, he expected little advantage from ſeeing, worth undergoing an operation for, except reading and writing; for he ſaid, he thought he could have no more pleaſure in walking abroad than he had in the garden, which he could do ſafely and readily. And even blindneſs he obſerved, had this advantage, that he could go any where in the dark much better than thoſe who can ſee; and after he had ſeen, he did not ſoon loſe this quality, nor deſire a light to go about the houſe in the night. He ſaid, every new object was a new delight; and the pleaſure was ſo great, that he wanted ways to expreſs it; but his gratitude to his operator he could not conceal, never ſeeing him for ſome time without tears of joy in his eyes, and other marks of affection: And if he did not happen to come at any time when he was expected, he would be ſo griev'd, that he could not forbear crying at his diſappointment. A year after firſt ſeeing, being carried upon Epſom Downs, and obſerving a large proſpect

ſpect, he was exceedingly delighted with it, and call'd it a new kind of ſeeing. And now being lately couch'd of his other eye, he ſays, that objects at firſt appear'd large to this eye, but not ſo large as they did at firſt to the other; and looking upon the ſame object with both eyes, he thought it look'd about twice as large as with the firſt couch'd eye only, but not double, that we can any ways diſcover.

I HAVE couched ſeveral others who were born blind, whoſe obſervations were of the ſame kind; but they being younger, none of them gave ſo full an account as this gentleman.

Appen: TAB: I.

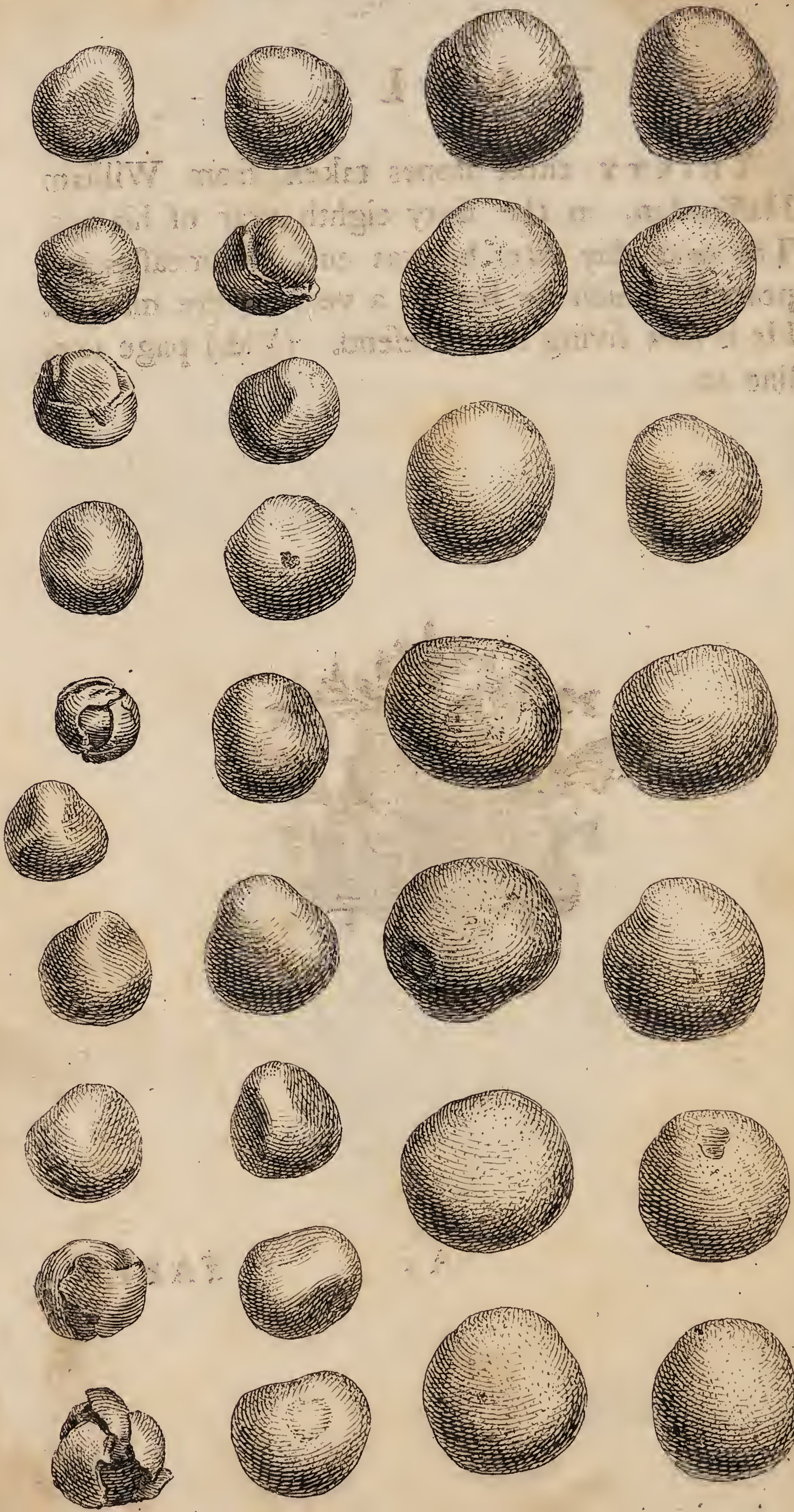


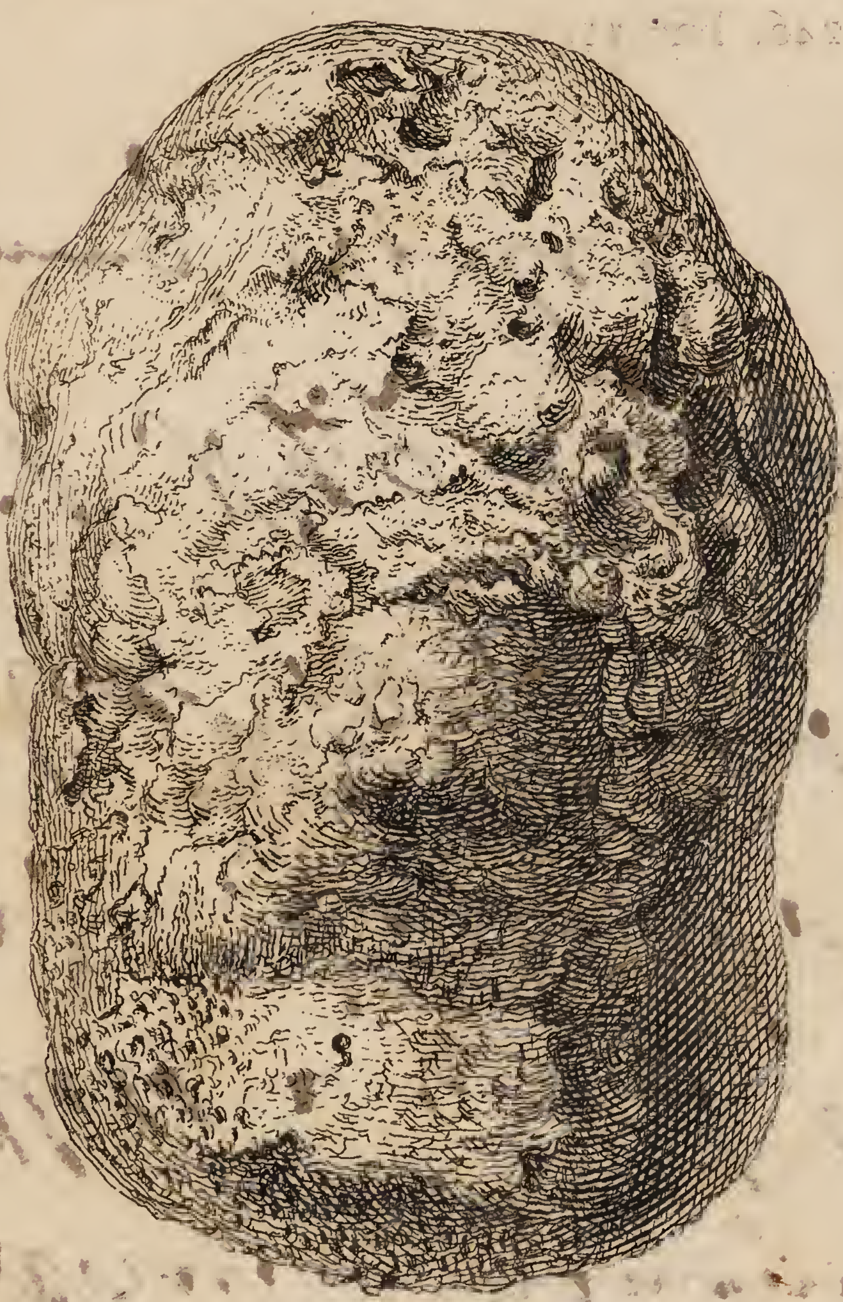
TABLE I.

THIRTY three ſtones taken from William Haffenden, in the ſixty eighth year of his age. The next day after he was cut, the meaſles appeared, which he had in a very ſevere manner. He is now living at Graveſend. (Vid.) page 245, line 20.

TABLE II.

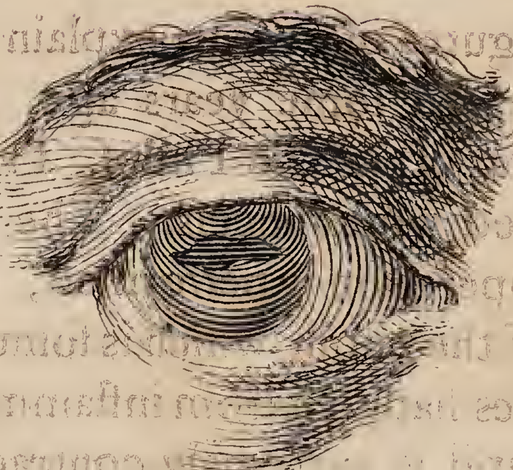
A STONE which weighed eleven ounces, and meaſured ten inches round, taken from John Miles, who is now living at Reading. (Vid.) page 346, line 11.

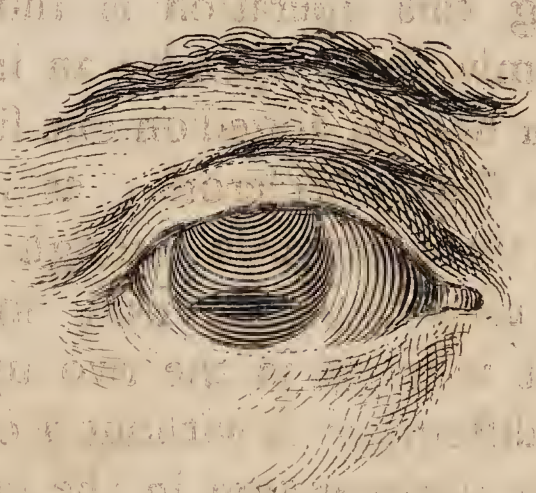
Appen: TAB. II.



℞ Pulv Rhei
Gum Myrrh pulv
Extract Chamom aa ʒj
Aloes Succot pulv ʒß
Ol Chamom Stillo ʒ x
Elix Proprietat q. s. f
Pil No 42 Capiat ij vel
omni Nocte

Appen: **TAB. III.**





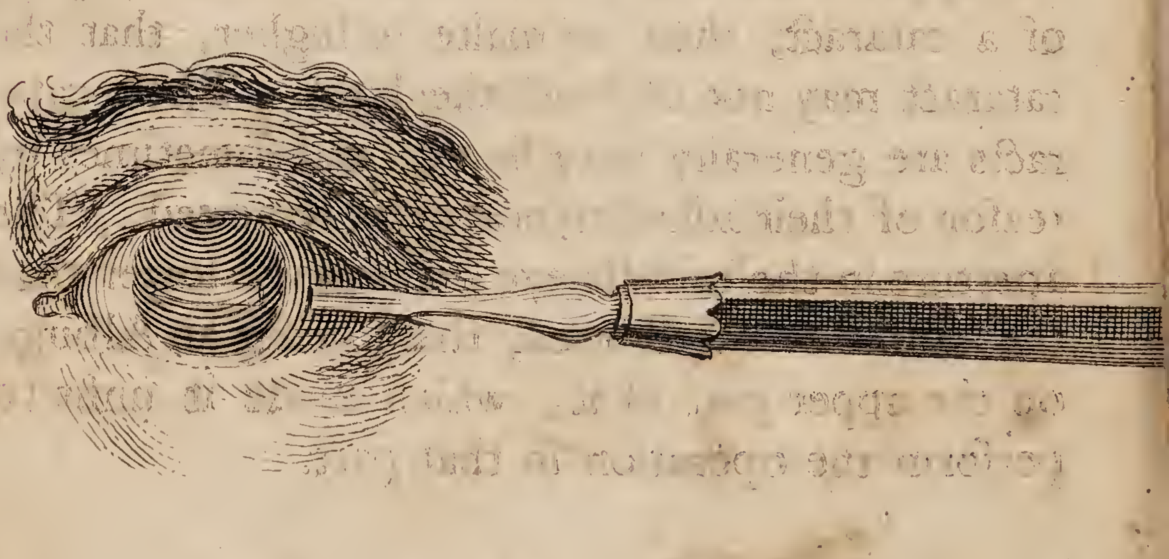


TABLE III.

Three figures of eyes to explain an operation, which I invented ſome years ago, and printed a ſhort account of in the Philoſ. Tranſ. and have often practiſed with ſucceſs. The diſtemper for which this operation is performed, is either a total cloſure of the pupil, which is ſometimes natural, and ſometimes happens from inflammations; or elſe when the pupil is extremely contracted, and the inner edges of the Iris growing to a cataract, or part of a cataract after couching. The manner of doing this operation is thus; the eye-lid being firmly held open by an inſtrument, a ſmall knife or needle, edged on one ſide, is thruſt through the Tunica Sclerotis, as in the lower figure; and then forwards through the Iris, the edge being turned to the Iris; in drawing of it out, a ſlit is cut as in the two upper figures. When this diſtemper is without a cataract, it is beſt to make the operation in the middle, as in the upper one; but if there is a cataract, or part of a cataract, then to make it higher, that the cataract may not obſtruct the light. Theſe cataracts are generally very ſmall, and ſometimes by reaſon of their adheſion not to be removed. The aperture in the middle eye, was made lower than the center of the Cornea, there being an Albugo on the upper part of it, which made it unfit to perform the operation in that part.

FINIS.